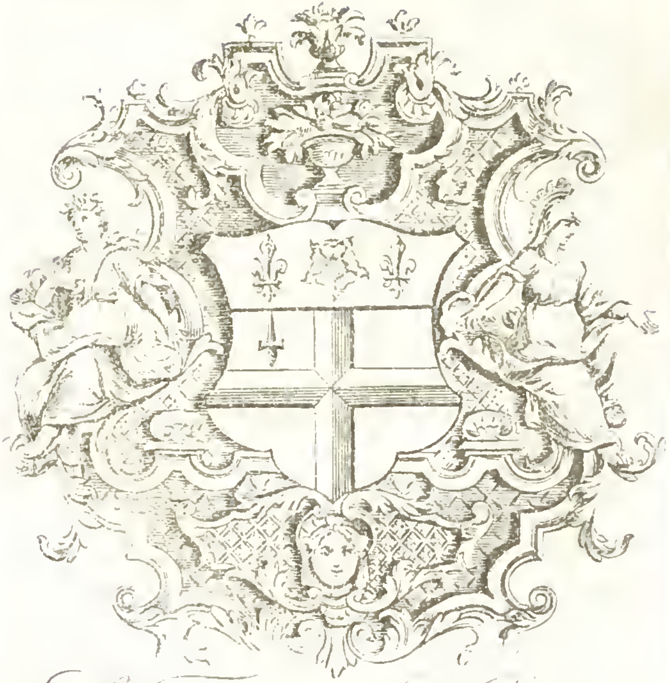
20.d.22.



St Thomas's Hospital
LIBRARY
0719

KING'S
College
LONDON

TOMHB TP570 PRE

Library

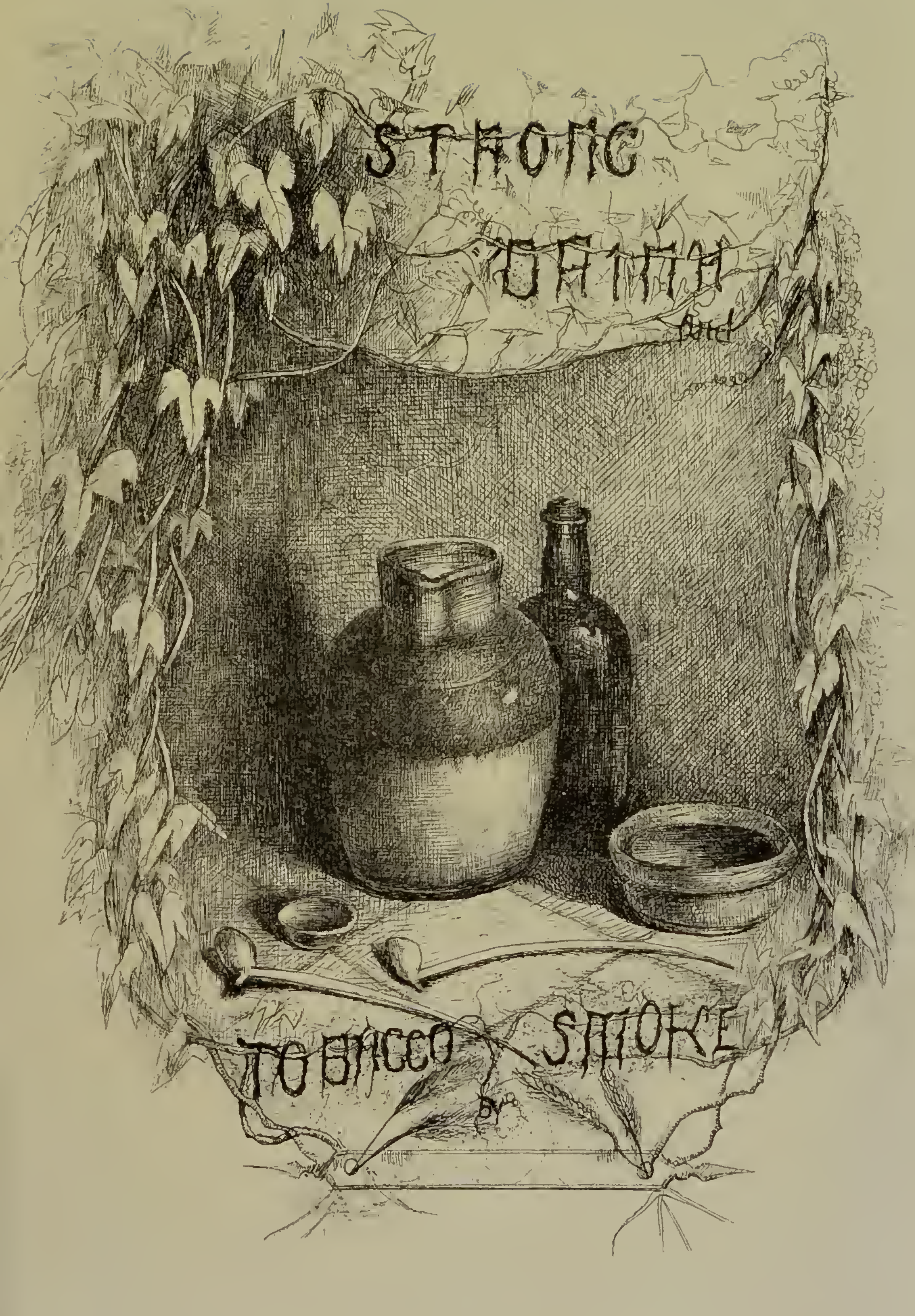
PRESCOTT, HENRY PAUL
STRONG DRINK AND
TOBACCO SMOKE
1869

201114222 9

KING'S COLLEGE LONDON

20.d.22.

STRONG DRINK AND TOBACCO SMOKE.


STRONG
DRINK
and
TOBACCO SMOKE
BY

STRONG DRINK

AND

TOBACCO SMOKE;

THE STRUCTURE, GROWTH, AND USES OF MALT,
HOPS, YEAST, AND TOBACCO.

WITH ONE HUNDRED AND SIXTY-SEVEN ORIGINAL ILLUSTRATIONS,
DRAWN AND ENGRAVED ON STEEL.

BY

HENRY P. PRESCOTT, F.L.S.

London:
MACMILLAN AND CO.
1869.

[*The Right of Translation and Reproduction is reserved.*]

"We indulge in a grand fallacy of the senses when we make the measure and rule of things correspond to Man and not to the Universe."—Lord Bacon.

". . . Where natural logic prevails not, artificial too often faileth. Where nature fills the sails the vessel goes smoothly on; and when judgment is the pilot, the insurance need not be high. When industry builds upon nature we may expect pyramids, where that foundation is wanting the structure must be low. They do most by books who could do much without them; and he that chiefly owes himself unto himself is the substantial man."—Sir Thomas Browne.

KING'S COLLEGE LONDON

PREFACE.

Much of the matter contained in the following pages formed the subject of a lecture, delivered on various occasions to country audiences, in which the attempt was made to popularise an interesting branch of science: Plant structure, life, and growth. For this purpose it mattered little what plants should be selected as illustrations, but it appeared to me, on reflection, that those which form the basis of our "Strong Drink and Tobacco Smoke" (the title chosen for the lecture) would prove more interesting and instructive than so-called less useful plants.

The introduction of the tobacco leaf as a subject for analysis was thought desirable, in these days of universal smoke, as affording an illustration of the simple means necessary to detect its spurious substitutes; thus enabling the smoker to become, if he choose, his own analyst. It affords an opportunity to display some striking illustrations of the variations which Nature elaborates in the minutiæ of the leaves of plants.

Practical men—farmers, brewers, and maltsters—will, I think, find in the pages of the book some hints which may prove of value, as suggestive of the waste of material constantly occurring in the granary, the brewery, and the malthouse.

Whilst divesting any subject of the technicalities of scientific language, I have endeavoured to be strictly accurate as to facts, and the definitions of them.

For the rest, Nature may speak for herself in her own eloquent language, through her works and the marvels of them.

HENRY PRESCOTT, F.L.S.

St. John's Wood,
July 1868.

EDITOR'S PREFACE.

Though having no special knowledge of the subject treated of in this book, I have endeavoured to see it safe through the press for the sake of its writer, who was a very old friend of mine. The son of an actor who stood high in the estimation of the past generation of playgoers, but who died while his children were young, Henry Paul Prescott was very early thrown upon the world to shift for himself. Gifted with much natural taste and feeling for art, he tried as a boy to carve out a career for himself among the painters. But before starvation overtook him, he was fortunate enough to find shelter in the Excise. Mr. Wood, long the chairman of the Board, who had known his father and always took a kindly interest in the fortunes of Prescott and his elder brother, providing places for both in the service over which he presided.

It was while serving in the lower grades of the Inland Revenue hierarchy that my friend acquired the familiarity with the character of malt, hops, and tobacco, which is evidenced in the following paper.

He took to the microscope, partly for the love of it, partly for its usefulness in his profession, and partly, I think, because it gave him an excuse for the practice of etching, an art of which he was passionately fond, and in which the plates which accompany this work show that he had attained no mean proficiency.

For years past the preparation of these plates, and of the text which accompanies them, had been the solace and occupation of his leisure; and it was his great ambition to publish them. But a few months ago he fell into a rapid consumption, that which carried off his elder brother twenty years ago, and died without having seen more than the first sheet in type.

Critical readers will note much room for improvement in the text of the little book; but on the whole, it seemed to me better not to attempt to do more than remove obvious errors, or supply the place of obvious deficiencies in a work which pretends to be but an imperfect memorial of an incomplete life.

T. H. HUXLEY.

CONTENTS.

CHAPTER I.

PAGE
INTRODUCTORY 1

CHAPTER II.

MATERIALS 9

CHAPTER III.

HOW BARLEY GROWS 17

CHAPTER IV.

STRUCTURE OF BARLEY AND SOME OTHER SEEDS 32

CHAPTER V.

HOPS AND YEAST 39

CHAPTER VI.

MALT, BEER, SPIRIT 51

CHAPTER VII.

TOBACCO AND SOME OTHER LEAVES 63

LIST OF PLATES.

Vertical section of Coffey's Distilling Apparatus . . . . . . *To face p.* 56

PLATE I.

FIGS. 1. A representation in miniature of an inflated sheep bladder.—2. Part of same cut across its length.—3. A collection of same supposed to be held together.—4. A vegetable cell with two rings formed in its interior.—5. Another, with six rings.—6. Four cells super-imposed, united to form a tube.—7. Dotted ducts.—8. A vegetable vessel with deposit formed on its interior in a spiral curve.—9. Spiral vessels from leaf veins.—10. A reticulated vessel.—11. A scalariform duct.—12. A double-pointed wood cell.—13. A square-ended wood cell.—14. A collection of same as *tissue.*—15. A pitted cell from a deal shaving.—16. A part of a single-pointed wood fibre.—17. A branched wood fibre.—18. A pointed ditto.—19. A branched fibre from woody portion of a seed-coat.—20. An oblong cell from skin of leaf.—21. Two irregularly-shaped cells from skin of leaf.—22. Two irregularly-shaped cells from the skin of *Cocculus Indicus.*—23. A cell with wavy outline, from skin of leaf, under side.—24. Kidney-shaped cells from skin of leaf forming a *stoma.*—25. Same viewed in vertical section.

PLATE II.

FIGS. 1. A grain of barley with the husks removed from lower end to show *the Embryo.*—2 to 8. Grains of barley in different stages of development.—9. The young barley-plant.—10. A young rootlet.—11. A newly-formed leaf with *strap.*—12. Portion of a fully-developed leaf of barley.—13. A minute portion of a leaf blade cut transverse-vertically.—14. A horizontal section of barley stem.—15. A vertical section of the same.—16. A minute portion of skin of young straw with *hairs* developing.

PLATE III.

FIGS. 17. A barley plant.—18. Part of same divided down the centre, showing the size and position of *inflorescence*.—19. The same, showing the divisions of the *inflorescence* into undeveloped and developing portions.—20. *Inflorescence* in a very rudimentary condition.—21. Further development of same into lobed masses.—22. More advanced *inflorescence*.—23. One of the lobes developed into a perfect flower.—24. Ovary and one stamen separated.

PLATE IV.

FIGS. 25. A vertical section of mature barley straw.—26. A portion of *silicated* epidermis or skin from mature stem, showing the curved prickly hairs.—27. A portion of the epidermis of a leaf without hairs.—28. A minute portion of a very young awn, with spiral vessels and young hairs developing.—29. A diagram showing the position of the inflorescence relatively to the surrounding leaves.—30. Portion of barley ear showing the lateral supports by which each grain is protected.—31. *Pollen granules.*

PLATE V.

FIGS. 1. A grain of barley.—2. Another (damaged) grain.—3. Another (perfect) grain.—4. The *needle*.—5. Hard silicated hairs from its borders.—6. *The tuft* removed from base of grain.—7. The position of the tuft relatively to the embryo when the grain is cut across.—8. A minute portion of wing of tuft, showing the cellular tissue to which the long delicate filaments are attached.—9. Section of seed through the embryo.—10. Horizontal section of upper or leaf portion of embryo.—11. Ditto, of portion forming rootlets.—12. Starch granules from albumen of seed.

PLATE VI.

FIGS. 13. Seed coats of barley seeds.—14. Silica plates on outer layer of cells of skin when dry.—15. The same after the grain has been steeped in water for some time.—A *strobile* or fruit of the Hop.—17. A bract of same, showing the position of: 18. The seed at its base.—19. Seed with investing membrane to show the *lupulite*, very abundant on this membrane.—20, 21.—Seed divested of membrane viewed in face and on edge.—22. A granule of *lupulite* burst with dilute sulphuric acid.—23. A portion of a fruit of brewer's spent-hops, showing the position of the seeds and lupulite grains unaffected by boiling.—24. A minute portion of the seed pellicle or base of bract (17), beset with lupulite.

PLATE VII.

FIGS. 1. A grain of Cocculus Indicus.—2. A diagram of the seed constructed from dissections.—3. A grain of Paradise.—4. A diagram of the seed.—5. Oil globules from the large *cysts*.—6. A grain of Datura Stramonium.—7. A horizontal diagram of the seed.

PLATE VIII.

FIGS. 25. A minute portion of a Hop leaf.—26. The seed of the Hop.—27, 28. Portions of the acorn-cup of the Valonia Oak.—29, 30. Branched and simple hairs.

PLATE IX.

FIGS. 1. A leaf Virginian Tobacco attached to stem.—2. Portion of skin from under surface.—3. Hairs separated.—4. A transverse-vertical section of portion of leaf-blade, with hairs and breathing pores on under surface.—5. A horizontal section of midrib of leaf.—6. A leaf of Burdock.—7. Hairs from under surface of leaf terminating in long delicate filaments.—8. Horizontal section of midrib of leaf with lobed outline, and bundles of woody fibre separated.—9. Leaf of Dock, the stipule at base of stalk detached.—10. Club-shaped, striated hairs, from skin of midrib and veins.—11. Horizontal section of midrib, with lobed surface, and woody bundles separated.—12. A portion of skin of under side of leaf blade.

PLATE X.

FIGS. 1. A leaf of Chicory.—2. A horizontal section from midrib of leaf, with thin woody bundles.—3. A portion of the skin removed from under side of leaf.—4. Leaf of Comfrey.—5. Horizontal section of midrib of leaf, showing the position and character of woody bundles.—6. A minute portion from the skin of the leaf on its under side.—7. Leaf of Jerusalem Artichoke.—8. Horizontal section of midrib of leaf, with woody bundles.—9. Epidermis from under sido of leaf.

STRONG DRINK AND TOBACCO SMOKE.

CHAPTER I.

INTRODUCTORY.

"To eat, drink, and be merry," whilst life lasts, appear to be instincts of man's nature, scarcely requiring the sanction or the recommendation of a proverb; but from the hurried toil of life in which too many of us eat our daily bread, it may be good and refreshing to rest awhile, and turn to the green hill-side, to "look at the lilies of the field how they grow."

There we shall see all living objects, whether it be the insect on the wing in drowsy flight, or the bird up yonder carolling his song as if in praise and thanksgiving for the permission of life in this beautiful world; whether it be the humble plants of the varied thousands that adorn our English hedgerow:—

> "A violet by a mossy stone
> Half hidden from the eye;"

or the countless roses of delicate hue that adorn its summit—or, in the ditch beneath it, the brilliant flowers of the water-crowfoot, lying in graceful repose on its outspread leaves, whilst its silken tresses sway gently from side to side with the eddying current underneath; all these, as parts of animated Nature, fulfilling with thorough steadfastness of purpose the conditions for which they were called into being, a full and vigorous life, and so contributing their share to the enjoyments of man. Viewed thus, the most familiar objects of life that surround us afford ample scope for the attainment of real knowledge, exercise for thought, and an inexhaustible field for inquiry and research.

On the other side of that hedgerow lies a field of growing barley, and two fields beyond it, the graceful hop plants rear high in air their dazzling green festoons, stretching from pole to pole. Perhaps no two plants, since the world began, have had so great a moral influence on the human race; it may be that no other two products of nature, varied and beautiful as these are, ever so gladdened or made sad the hearts of men; for if to the fruit of these two plants we add another, the humble yeast plant, all the ingredients are present from which "strong drink," whisky, and beer, are obtained.

I purpose, therefore, to trace the life history of the barley plant, from its earliest growth to maturity and death, giving a description of the structure and minute anatomy of the root, stem, leaves, and seed. I shall show the careful provision which Nature has made for the healthy life of the plant in every stage of its growth, more particularly during its most critical period, the flowering, and maturing of the seed.

A careful examination of hop-fruit will show in what part of it is lodged the bitter principle, so valuable to the brewer, and, incidentally, it will be seen how much of it he unconsciously wastes. The nature and action of the yeast plant, with a glance at its use in the brewery and distillery, and a sketch of the "patent apparatus" by which English whisky is distilled at the rate of several thousand gallons per hour, will complete the chapters on strong drink.

Whilst smoking my pipe with you, reader, I will mix a leaf or two (literally "weeds") with your best cavendish, and when our cloud is blowing we will put our heads together, and try if we can find out what those "weeds" are.

Barley seed, when converted into malt, forms the practical ingredient of our strongest drinks—whisky, gin, and beer; and, although many other seeds of plants, such as rye, maize, oats, &c., can be malted, yet none are found so profitable for this purpose as barley.

And here, at the very outset of our inquiries, we may well be struck with astonishment: 1. At the fact that these seeds, which, when broken open, consist apparently of nothing but a fine white flour, surrounding a small conical body scarcely so large as a small pin's head, should, by being steeped in cold water for a few hours, become endowed with the marvellous power of strong healthy growth, even when free from contact with the earth. Though by no means difficult to observe in what part of the seeds this vital activity commences, or to demonstrate, with the assistance of the microscope, that the seeds of barley, like the plants which they produce, are nothing more than a collection of minute cells, we are nevertheless, after doing so, but a little nearer to the solution of those mighty mysteries which are included in the word, Life, although we have arrived at a comprehension of some of those agencies which produce its earliest manifestation.

This, though matter too deep for our philosophy, need not deter us from seeking the knowledge of other facts connected with the life of our barley plant, nor of studying some of the most beautiful provisions which Nature has made for the conservation and reproduction of a plant, that may be said to have become one of the staple necessities of society at the present time.

A special interest attaches, too, to the hop plant, as the source from which are derived the bitter and aromatic qualities for which English beers are prized, as the finest in the world. The dried fruit of this plant yielded, until recently, an enormous revenue to Government. It is, however, peculiarly liable to the attacks of the "fly," or "blight," and, on this account, it became so difficult to collect the hop duty, that it has been abandoned by the Government.

Yeast, with which both our bread and our beers are fermented, takes its place in the vegetable kingdom as a plant very low in its organization, but nevertheless immensely rapid in its growth, and appearing to require exactly the medium which is supplied by a saccharine solution, such as that of malt or mixed grain, for its continuous development.

From these three plants, then, we get our "strong drink," and it is a remarkable circumstance, that to use them in the manufacture of our beer, as in brewing, or of our whisky, the distilled spirit, we have to begin where Nature does—to grow the barley and yeast plants. In generating barley to convert it into malt, or in adding yeast to the brewer's worts to excite fermentation, we but imitate the earliest processes of actual plant-growth, though in both cases the operations are, at a certain stage, suddenly arrested. The result of fermentation, as is well known, is the production of the intoxicating element of both beer and whisky—alcohol—which is left mixed with saccharine matter, and hopped by the brewer; or separated from it in its more concentrated and purer state by the distiller.

Such, then, are the bases of our strong drink. I fear that our tobacco will not always bear so satisfactory an analysis. The reason of this is obvious. The temptation to adulterate tobacco is very strong, and will ever remain so whilst the tax on importation bears such an enormous ratio to the value of the taxed material, as that of a 3*s*. tax on tobacco leaves worth from 6*d*. to 1*s*. per pound. Besides, not one person in one hundred, or, it may safely be stated, in one thousand, has the slightest acquaintance with the general features and characters of genuine tobacco. Most of us, therefore, must be powerless in the hands of the fraudulent manufacturer, to whom we not unfrequently pay something more than 3*s.* 6*d.* per pound for the leaves of wayside plants—dock, burdock, foxglove, elecampane, &c. &c.—with which our tobacco leaves are, at times, contaminated. If it is somewhat unpleasant to be thus reminded of what we may be smoking, it is equally satisfactory to know that very little patience and attention are all that are requisite to gain a knowledge of those marked and unchangeable characters which Nature has stamped on the leaves of plants, as on all her productions; and thus, those of them invisible to the naked sight can, with the help of a microscope, be traced in our cigars, our cut tobaccos, and even in our snuffs. Nor is much learning requisite to master the few and simple features which characterise these leaves; for they are of so marked and constant a character, so easily to be understood, and the analysis of them lies so completely within the reach of ordinary intelligence, as to be well worth the trouble of acquiring.

And this leads me to the manner of treating my four plants. A cursory glance at some of the numerous illustrations of the book, will impress many readers with a notion that the objects delineated are as strange-looking as they are novel; but they are not, on that account, difficult to understand, or, as I believe, unworthy of being studied. Prominent among these will be found sections, or slices, of the various parts of the plants under consideration, and in every instance they are intended to represent their structure in a given direction. For instance, in order to trace the growth of the barley plant, we must begin by placing the seeds in moist earth, or in water, for a day or two, and then watch their germination, and the gradual development from day to day of the young plants. The examination of the tissues composing the leaves and the straw, in their gradual development, will exhibit some most interesting structures under the microscope. Carrying our researches a step farther, the germs of the future flowers of the plant may be easily discovered, and these traced to their fructification and ultimate development into mature seeds; thus completing the cycle of the plant's life from a seed to the seed again. So, again, with the hop plant; if the leaves and bracts of the fruit are examined with a magnifying glass, our admiration is immediately aroused by the beautiful form, colour, and arrangement upon their surfaces, of thousands of minute golden-coloured, granular bodies, which contain the *lupulite*, so valuable to the brewer.

Descending to the lowest region of vegetable life, we have the yeast plant, whose marvellous development from simple *cells* into long threads or filaments, by cell-division and multiplication, may actually be watched on the field of the microscope, when the plant is fed with a solution of sugar.

The external characters of tobacco leaves contrast curiously with those of other plants. Interesting on this account, they become even more so when examined under the microscope. We then see the never-ending variations which Nature elaborates in the internal structure of the leaves of plants, no less than in the form and characters of the minute, invisible hairs with which their surfaces are adorned; these last serving us, even when the leaves have been pounded to dust, as infallible records of the plant which has produced them.

In short, search where we will in Nature's laboratory, her surprising variations of form, her myriad methods of varying minutiæ, excite our wonder at every step we take in the endeavour to unravel these hidden beauties.

CHAPTER II.

MATERIALS.

BEFORE proceeding to grow our barley seeds in order to obtain young plants for the examination of their tissues, it will be necessary to give a brief sketch of the elements of which plants generally are composed.

Let Plate 1, fig. 1, represent, on a very large scale, a minute bladder, distinguishable only as such by the aid of a microscope. This, when cut across at a right angle to the direction of its length, or horizontally, would have the appearance represented at fig. 2, seen in perspective. Suppose a number of such bladders to be held together at certain points of their surfaces, and their ends to lie in different planes; if a knife-blade were passed through them, as in the previous instance, the section would have the appearance represented at fig. 3. A second cut through such a tissue, in the direction of the transverse line, would divide three of the bladders just above their ends, and would escape the other two. Now we have only to call these suppositious bladders vegetable *cells*, and their skins the *cell-walls* (in nature much more transparent than these skins), and we have a tolerable illustration of the composition of the soft, juicy parts of most plants, that is to say, *cellular tissues*, and the illustration will further show the vacant or intercellular spaces, where the cell-walls do not infringe upon each other. When such a section as that included between the upper surface and the line *a*, fig. 3, is placed under the microscope (supposing it to be sufficiently thin and transparent to transmit light), it is evident that the side walls of five of the cells will be visible, and the ends only of two.

But many plant cells possess the singular property of forming on the inner surface of their walls a deposit, which takes sometimes very eccentric and very beautiful forms. Of these the most simple is that of a ring or rings, as in the cells found in many of the *Cacti*, one of which is represented at fig. 4, in which two such rings occur, serving probably to give it strength. Fig. 5 is another cell, with as many as six distinct rings visible on the inner surface of its wall. This deposit very frequently overlies almost the entire surface of the cell, leaving, where it is absent, minute dots which admit the light readily through them. Fig. 6 represents a row of such cells, which are also very abundant in elder pith, but possess fewer markings or dots.

Any or all these forms of cells, when collected together, as shown at fig. 3, form what is called, technically, a *cellular* tissue, as distinguishing it from another tissue common among plants and abundant in wood, which I will now describe.

In the growing parts of plants are found, in all stages of development, long tubes or *vessels*. These, in many instances, are seen to be formed by a series of cells placed one above another (Plate 1, fig. 6), their ends becoming finally obliterated, when they form canals or vessels, such as are represented at fig. 7, having their walls dotted. This description of vessel is called a *dotted duct*, and is very common in the roots of many plants, such as chicory.

Vessels, like cells, have their walls lined internally with a deposit. Fig. 8 represents one of them with such a deposit, in the form of a fibre wound spirally on its wall, the fibre having become stretched by the elongation of the vessel.

Beautiful examples of spiral vessels occur in the veins of leaves (fig. 9); they are abundant in the stem of the strawberry plant, and are readily seen by passing a knife-blade gently round the stem, and then dividing it by gradually drawing the parts asunder. The fine threads thus obtained, when examined under the microscope, will be found to consist of spiral vessels, with the fibres more or less unrolled at their extremities.

Another very common form of vessel (fig. 10) is known as *reticulated*, owing to the broken irregular form which the deposit assumes.

Fig. 11 represents portions of three vessels taken from the stem of the vine. These are called *scalariform* ducts, owing to the deposit being formed in bars, similar in appearance to the rungs of a ladder.

Groups of any or of all these forms of vessels (Plate 1, figs. 7—11) are known as *vascular tissue*, as distinguished from the *cellular* tissue above described.

The continuous growth of a plant is generally accompanied by the formation of wood; that is to say, much of the cellular tissue is supplanted by tougher and more unbending material, more suitable for the support of the plant during growth. These woody parts are mostly composed of long *fibrous* cells with thick walls. Fig. 12 represents one of them pointed at both ends, and fig. 13 another with nearly square ends. They occur in abundance in herbaceous plants, and in all wood knit together into a tissue, such as is seen at fig. 14. When united in one tissue with the vessels before described, the compound tissue is called *fibro-vascular*.

A common deal shaving exhibits, under the microscope, a tissue composed of long cells pointed at both ends, and having on their sides pits, or cup-shaped depressions (fig. 15), which in two individual cells are fitted face to face, and thus form a cavity for the reception of the resinous matter which we smell so perceptibly in freshly-cut deal, or in newly-planed deal shavings and sawdust.

A curious form of the fibrous cell is, according to some authors, found in bark (figs. 16, 17), some being branched. Fig. 18 is another form of fibrous cell, also found in bark, and like some cells *dotted*. In inner coats of seeds are commonly found minute, elongated cells that have coalesced to form long delicate fibres (Plate 1, fig. 19). Stringy, tough vegetables, with which we sometimes make unpleasant acquaintance, owe their unpalatableness to the large quantity of fibrous tissue which they contain.

The outer coverings or skins of herbaceous plants are very frequently composed of thick-sided, flat, tabular cells (figs. 20, 21). The upper surfaces of leaves are frequently covered with a thin pellicle of cellular tissue (fig. 22); their lower surfaces with a tissue composed of flat, tabular cells with wavy outlines (fig. 23).

Many readers will be surprised to learn that plants breathe principally through their leaves, but the experiments of philosophers have placed the fact beyond question. The delicate organisms by which this function is performed may be well seen by detaching a minute piece of skin from the under side of a leaf, and placing it in water under the microscope. These will be seen lying in great profusion amongst the peculiar flat tabular cells, with undulating outlines (fig. 23), peculiar to this part, as minute, kidney-shaped cells, touching at their ends and having a slit or minute opening between them. One of these, viewed from above, and greatly magnified, is seen at fig. 24, and cut through vertically at one point of their junction at fig. 25. As moisture is supplied to or withdrawn from the leaves either by imbibition or evaporation, these breathing pores (*stomates* as they are called) expand or contract, and in so doing partially close or open the slit, and so regulate the passage of moisture and gaseous matter from or to the interior of the leaf. Though very minute, they must, from the fact of thousands of them occurring within a square inch of surface, play a most important part physiologically in the life of the plant.

It is also on the skin of the leaf that the peculiar cellular appendages, *hairs*, are placed. These are found sometimes in two or three different forms on the same leaf, and although frequently invisible to the naked eye, are, from their excessive transparency, very beautiful objects under the microscope. Their forms and characters are as constant for each leaf as they are diversified in the leaves of different plants; and, as our investigations proceed, it will be seen how objects so simple as a hair may be made available in the analysis of tobacco leaves.

The plants and leaves, the structure of which we have now to study, are nothing more than variously disposed groups of cells and vessels held firmly together; I have now to describe briefly the manner in which they may be most profitably studied.

An architect, desirous of conveying an idea of the form and construction of the house he intends building, prepares very carefully a series of drawings, exhibiting ground plans and sections of the various parts of the proposed building. We, on the other hand, have to take to pieces the fabric which Nature has constructed, in order to obtain our ground plans and sections. This is accomplished by making careful sections of the plant from every part of it and in every direction of its growth, and submitting these to the searching power of the compound microscope, in order to view the structure from every point. For instance, a thin slice of the young green stem of barley cut horizontally (at a right angle to the direction of its growth), and placed in water on the stage of the microscope, will show whether the woody (*fibro-vascular*) tissues lie together in one mass, or are scattered in small wedge-shaped bundles (Plate 2, fig. 14). A thin slice from the same stem, cut vertically in the direction of its growth (Plate 2, fig. 15), will show the composition of its tissues, and from this, individual cells and vessels can be carefully dissected out under the dissecting microscope with two fine needles, for examination under the compound microscope, when their beautiful transparency will render their minutest structure very evident. If, in cutting these sections, the knife blade should by accident pass through (as it will do frequently) some part of a minute vessel in a somewhat slanting direction, the student will be rewarded with a view of a part of the interior of it, and will thus be enabled to compare the appearances of both surfaces. In fact, in this as in other matters, chance or accident will sometimes accomplish for us that which our most patient labour will not.

I shall have to speak of the method of examining leaf structure when treating of hops and tobacco, taking it for granted that the reader knows what books to read amongst the numerous published works on the microscope and its management. For the rest, successful study should depend less on books than on hearty desire and a strong will.

CHAPTER III.

HOW BARLEY GROWS.

Having given a general outline of the composition of a plant, the reader will be prepared to understand the process of growth of a simple grain of barley. If a grain be taken, and the outer husk and inner skin are removed from the thick end of it, on its smoother or ungrooved surface a small conical body will be found lodged in the white mealy portion of the grain, and darker than it. This is the *embryo* of a young plant (Plate 2, fig. 1) awaiting some exciting cause to bring its latent powers into action. Place a few of these grains whole in moist earth for three or four days, and watch the result. On examining the grain at the end of that time, it will be found that, although in external appearance it only exhibits a swollen appearance, yet, on opening it, or tearing away the husk, its internal characters have very much changed. Instead of the white mealy mass, we have a pasty-looking substance, the embryo has elongated considerably (fig. 2), and a number of slender filaments are protruding from the end of the grain, having burst through its husk. In two or three days more, if we remove the husk from another grain, we find a tough, almost horny structure, to which the little remaining mealy part of the grain most tenaciously adheres (fig. 3). This body is called the *cotyledon* or embryonic leaf. Growing as it were from this, and attached to it, is a small greenish conical body, another young leaf, whilst the extension in growth of the horny mass downwards forms the basis from which the young rootlets grow into the earth (Plate 2, figs. 4, 5). In a day or two, a still further development of the plant is seen; by removing the upper leaf, another still younger is found to have grown from the stem within it (fig. 6).

It will be observed, that one important feature of the plant's structure is illustrated in the growth of the leaves one *within* another, each younger one forcing the older one next to it in an outward direction. Fig. 7 represents a young plant about nine days old, removed bodily from the soil. The husk of the grain is still adhering slightly to the plant, but when this is removed (fig. 8), the contents of the grain are found to have undergone an entire change; instead of the white mealy mass which it once contained, its place is occupied by the bases of the leaves, and the tough horny substance to which these and the rootlets are fixed. The fact is, that the embryo, whilst growing, and forming rootlets and leaves, has evidently done so at the expense of the mealy portion of the grain—a beautiful provision that

Nature has made for the young plant, until it is able to assimilate other food.

The diagram (Plate 2, fig. 9) represents, on a much enlarged scale, a section of the young plant at the foregoing stage of its growth, cut open vertically, the leaves being represented by lines. There are six of these, exclusive of the cotyledonary leaf (*c*), and the figures 1 to 6 represent the order of their growth. No. 1, the first formed leaf, has been superseded in growth by No. 2, and has then died down; No. 2 in its turn will be outgrown by No. 3, and will then die down; and so with the others, the point from which they grow being a dense mass of living vegetable tissue. I shall have to return to this part of the subject when treating of the stem; in the meantime let us examine the rootlets of the plant. These are so delicate, that they may be placed bodily on the stage of the microscope in water, and pressed down under a thin glass cover. They will be found to consist of a mass of minute elongated cells, with very thin walls; in the centre of the mass spiral and other vessels are forming. But at the point of each rootlet is a peculiar conical body (fig. 10) called the *root cap*, which is supposed to assist materially in absorbing the salts and other matters held in the soil for the nourishment of the plant. This function is denied to it by many, but it is clearly proved that if these caps are broken off they are never reproduced and the rootlets wither.*

---

* Schleiden's Principles of Botany, p. 220.

The structure of the mature leaf will have to be considered presently. I draw attention now to the leaf in its youngest state, in order to illustrate a peculiarity in its structure that has a most important relation to the mechanical support of the entire plant. Examine one of the leaves of barley in as early a stage of its growth as possible (Plate 2, fig. 11), and here will be found, at the base of it, an elevated ridge of cellular tissue. This never lengthens to any great extent during the growth of the leaf, but it thickens considerably, and becomes, in a mature leaf, very tough and elastic. It is called the *strap* (figs. 11, 12 *st*), and performs the most useful office of preserving all that portion of the leaf which grows after it, for a time, in a cylindrical form. It thus encloses and protects the inner younger leaves (and, as we shall presently see, the flowers and fruit) until these, becoming too bulky, snap the strap asunder. The economy of Nature, vast as it is, can scarcely show a single contrivance more simple, or more admirably adapted for the purpose which it serves.

Fig. 13 represents a portion of a transverse-vertical section of a mature leaf of barley. In the centre of the section is the bundle of woody tissue (fibrous cells, spiral and other vessels) forming the middle vein of the leaf, and on either side of it three other such bundles running parallel to it. They are surrounded by loose cellular tissue, and enclosed or covered on both surfaces by abular-shaped cells, forming the upper and under skins of the leaf.

Plate 3, fig. 17, represents a young barley plant about six inches high. A slight swelling will be observed at one part of it, *g*. When cut open vertically its whole length (fig. 18), the stem is found to be perfectly hollow, excepting at certain points of it, where (as at *a*, *b*) diaphragms, or solid plates of cellular tissue, extend across it. Just above the upper one of these plates is a small, conical semi-transparent body, *g*. Fig. 19 is a highly-magnified representation of this part, which in reality is, at this time, no bigger than the head of a pin. Observe that all but the two inner leaves of the stem have been removed to show it more clearly. This minute body consists of two parts, and from it grow, by constant addition of new tissues, the inflorescence or flower axis, *a* (fig. 19), and *b*, the leaf axis or stem, the entire mass forming the terminal bud of the plant of which *a* and *b* are the flower and stem portions in a rudimentary state.

The mode of growth may be thus explained. Whilst the base of the terminal bud rested as it were on the diaphragm *d*, a leaf-bud was formed, and, on expanding into a leaf, the tissues from which it grew on the stem also increased and lengthened by the constantly renewed vitality imparted to them by the respiration of the leaf. By the time the stem has grown the length of the internode (fig. 18, *a* to *b*), the terminal bud has also increased in diameter, another leaf-bud is forming, and the plant repeats the process of horizontal and vertical growth.

At each point, where a new leaf-bud, and consequently a new leaf, was produced, a solid plate of tissue (diaphragm) remains for a time; but as the diameter of each node of the stem increases, the central portion not being renewed, the stem in time becomes hollow.

In the centre of the lobed inflorescence (fig. 19, *a*) may be clearly distinguished, even at this early stage of its development, the flower and fruit-bearing stalk; at the base of this again is the last undeveloped joint of the stem, and beneath this the solid mass from which other leaves and internodes of the stem will be formed.

Plate 2, figs. 14 and 15, represent a horizontal and a vertical section of the mature green stem of barley. The sections are not cut across or through the middle of the last formed diaphragm, for then we should have a solid mass without the intervening space represented by the white ring which here separates the outer developing stem from the inner more immature portion, but at a point just above *d* (Plate 3, fig. 19).

The structure of the stem is well seen in the vertical section at Plate 4, fig. 25, where the spiral vessels are seen lying amongst the woody and dotted fibres, whilst the inner circular cells of the pith are gradually being torn asunder by the horizontal expansion of the stem at the internode above. The development of hairs on the outer skin may be easily traced on the young green stem. In early growth they have the appearance of minute knobs (Plate 2, fig. 16). When they are mature, and have become silicated on their outer surfaces, they have a more formidable appearance (Plate 4, fig. 26). They are most numerous on the green awns of the seed, where they may be seen in all stages of development (Plate 4, fig. 28 *h*).

A remarkable feature in the growth of our plants is the power they possess of absorbing from the soil, and secreting in their tissues, a very large amount of silica, the basis of flint-stones and of glass. In the ashes of barley straw De Saussure, a French chemist, found 57 per cent. of this substance; more recently our own illustrious chemist, Fownes, has given the analysis of straw from barley grown in Battersea Fields. When burned, it yielded 6·97 per cent. of unconsumed ashes. These ashes, on analysis, yielded in the soluble portion of them:—

Sulphate of potash	16·6	per cent.
Chloride and little silica	0·4	,,

In the insoluble portion:—

Siliceous scales	70·5	,,
Phosphates of lime and magnesia . .	8·5	,,
Carbonate of lime	2·0	,,
Alkali, magnesia, and loss	1·5	,,
Water	5	,,
	100·0	

Of this silica, 87 per cent. was uncombined with any earthy or alkaline base.

Under the blow-pipe this silica may be made to fuse into a glass of topaz-yellow colour. Under the microscope it is seen as an extremely delicate transparent layer overlying and penetrating the cells of the outer skin, and is in many places rent and torn by the distension of this tissue (Plate 4, figs. 26, 27). Silica is one of those substances which the chemist finds some difficulty in obtaining in a perfectly pure state, yet we see our humble barley plant, in some most mysterious way, assimilating it in truly wonderful proportion.

I come now to the most interesting part of my subject. There are few people who do not take some interest in flowers. Those who do will not have failed, during a summer walk through a field of standing corn, to have seen and to have admired the wild poppy growing up amongst the forest of straw, and if they have plucked them, will recall to their minds those exquisite lines of Robert Burns, from his poem of "Tam O'Shanter:"—

"But pleasures are like poppies spread,
You seize the flower, the bloom is fled;
Or, like snow-flakes on a river,
A moment white, then lost for ever!"

All can appreciate the aptness of Burns' simile of fleeting pleasure, and the evanescent beauty of one of our loveliest wild plants; too often, the farmer would say, the close companion of growing barley. But from the eyes of Burns, as from our own, lay hidden many beautiful objects teeming with wealth for us. Though showing no outward signs of attractiveness, there yet lie carefully enfolded within the leaves of those green modest-looking barley plants, the germs of future flowers, and of fruit yet to be garnered. Plucking up a plant, root and all, and examining its exterior very carefully, a slight distension or swelling will be observed about midway (*g g* Plate 3, fig. 17) up the stem. If the plant is now cut vertically through its entire length (fig. 18) a small conical, semi-transparent body, in reality no bigger than a pin's head (to which allusion was just now made in speaking of the stem), will be found at *g*. Fig. 19 *c* is a highly magnified representation of this body, which is the inflorescence, or flower-bearing portion of the plant, whilst still very young. When detached and more highly magnified it has the appeararance represented at fig. 20; that of a gelatinous, semi-transparent, conical body, with lobed margins. If we watch closely from day to day the development of this inflorescence, it will be found to increase rapidly in bulk, and to alter considerably in form.

Another stage of its growth is exhibited at fig. 21, in which the lobes are more strongly marked, and more numerous, and the mass has become broader. In a short time a still further development is observed (fig. 22), each lobe assuming distinct parts, the rudiments of floral leaves. Each lobe at length develops into a perfect flower (fig. 23), which, with its appendages, is something larger than the head of an ordinary pin, and of a pale yellow colour, with all its parts semi-transparent.

Whilst in this condition, the inflorescence is most cautiously protected from violent accident or atmospheric influences. Plate 4, fig. 29, is a representation of a horizontal section of the plant through the inflorescence, and the surrounding leaves. In the drawing, the centre or midrib of each leaf, from the oldest to the youngest, is represented by the letters *a*, *b*, *c*, and if the convolutions of each leaf are traced, the leaves will be found to be so situated relatively to each other as to form five distinct coverings within which the inflorescence in the centre is. Truly this part of the plant's economy has been wonderfully contrived!

When mature, it will be seen that each lobe of the inflorescence has developed into a minute body, composed of three distinct parts, or *florets* (Plate 3, fig. 23). The two lateral ones (*a a*) are barren, and produce no seed; the central one is fertile, and consists of two outer scales (*b b*) with awns, which soon wither away; two other inner ones (*d*), enclosing a small body, the pistil, to which are attached, at its base, three oblong, yellowish bodies, with slender stalks; these are the stamens of the flower. We have here, then, a perfect flower with its reproductive organs, three stamens and a pistil. On opening one of the anthers of the stamens, *a* (fig. 24), there will be found lining its sides a quantity of fine yellow powder. This is known as pollen (Plate 4, fig. 31), and is the fertilizing principle of the flower.

At a certain period of the plant's growth, and whilst the inflorescence is yet protected by the sheathing leaves, these pollen granules fall from the anthers on to the feathery stigma (*st*) at the top of the ovary (Plate 3, *o*, fig. 24); they then thrust out long slender tubes, which penetrate the ovary through the style (*st*), and there discharge a viscid secretion which they contain. When thus impregnated, the embryo of a new plant is formed within the ovary, which becomes in time the seed. After impregnation, the stamens wither and fall off; the inner and outer scales of the flower close around the ovary, and become the inner and outer coats of the future barley-seed; and the barren florets (*a a*, 23) form, in time, the lateral appendages which help to keep the grains firmly fixed on their fruit-bearing stem (Plate 4, *a a*, 30).

Each lobe of the inflorescence having developed into a flower, the process explained takes place simultaneously, or nearly so, in each of them; and, in a short time afterwards, we see the green ear of barley bursting the strap of the uppermost and youngest leaf, which has, until now, enfolded it. It then bends downwards by its own weight, and is seen as the graceful ear of barley.

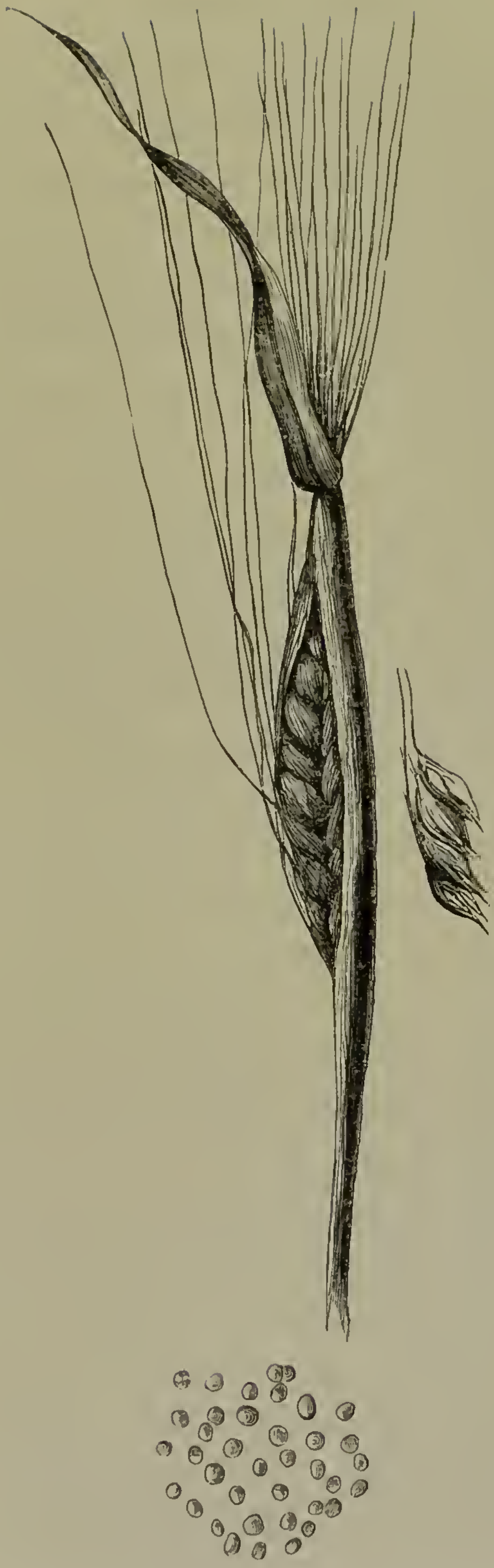
I found the fertilized ovaries to weigh, on an average, one-twentieth part of a grain, and the ripe, mature seed, seven-tenths of a grain: so that, from the time of the impregnation of the ovary to its maturity as seed, each ovary has increased its original weight thirteen times.

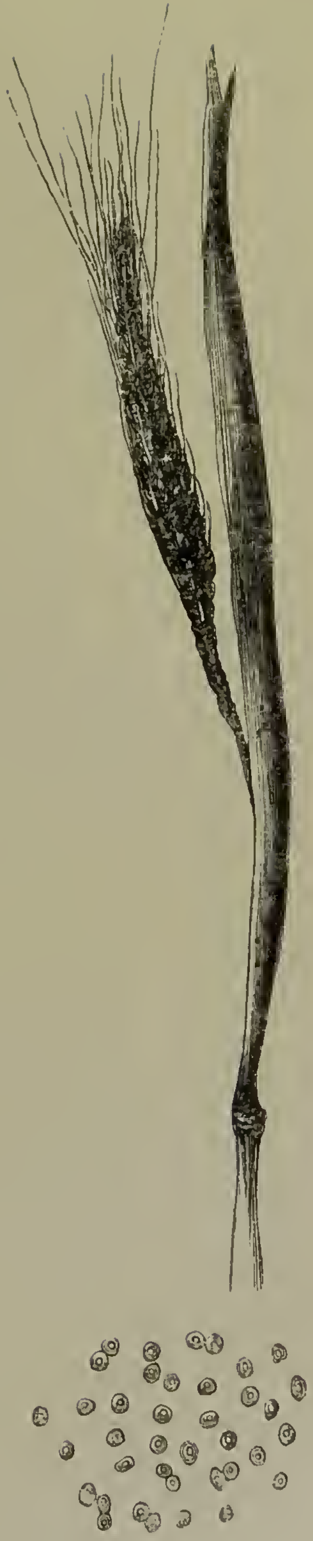
What particular office do the awns of the seed (fig. 30) fulfil in the economy of the plant? Comparing an ear of wheat with one of barley, the seeds of the former are found to be surrounded by several loosely-fitting coats (husks), which readily fall away on threshing, leaving the seeds naked. These serve as a sufficient protection from rain and atmospheric influences. In place of these, barley-seed, as we have seen, is furnished with two tightly-fitting tunics; and lest these should become damaged by moisture, they are furnished at their points with long, tapering awns, covered with minute hairs. The awns serve as admirable contrivances to carry off an excess of moisture, which might otherwise act injuriously on the seed. Such appears to me an explanation of the use of these very elegant appendages of the seed.

The use of the hairs, which are so abundant in the awns (and which, on reference to Plate 4, fig. 26, will be seen to curve outwards and upwards), is not so readily explained. The story is told of a youth who, whilst passing through a field of growing barley, carelessly snatched and placed in his mouth a few of these "barbed" awns. It so happened that they passed down the wind-pipe with the points of the hairs uppermost, which effectually prevented their dislodgment by coughing. This seemingly trifling incident led to violent hæmorrhage of the lungs, caused by these silicated hairs, and speedy death.

I have considered our barley plant hitherto as in a flourishing and healthy state of growth; but it, like other things, is subject to disease and death before reaching maturity.

Contrast, for instance, the two plants on the next page;





the one blooming with health, the ear just ready to leave its last loving support and covering, to bend downwards with its weight of fruit; the other, stark and stricken with a black disease, a lifeless and almost shapeless mass of cankering dust. This appearance is caused by *smut*, a fungus that attacks the barley plant during its flowering, and destroys what, but for it, had become a thing of beauty and of use.

The smut is a very fine black powder, which has entirely replaced the tissues that were developing into flower and seed; no trace of them being left, excepting such as hold together quite feebly a rude, shapeless mass, that was once almost a perfect flower. In what peculiar way this fungus settles on its victim it is difficult to imagine, for we have seen that the inflorescence of the plant is so carefully protected by the sheathing-leaves as to render any attack upon it from without, even by the deposit of minute gems floating in the air, scarcely possible. But there it is, all too plainly, and the reader may judge of its impalpable fineness when told that the figures represent the spores of this fungus in a dry state, and in water, magnified 400 diameters.

If I have been successful in describing the barley plant, and have made its life-history intelligible, the reader cannot fail to perceive how admirably Nature has adapted it for the growth and protection of its flowers. She has lodged them with amazing skill within a series of folding leaves, whose convolutions form around it a covering five times repeated. She has further endowed the plant with the wonderful power of abstracting silica from the soil in which it grows to harden and protect both stem and leaves with a nature as glistening as steel itself, and has so adapted its form and mode of growth as to suggest the utmost economizing of space: finally, to complete her fair work, ere its life is ended by the reaper's sickle, and its gracious fruit is gathered for our use, she has clothed it in golden hues to gild—

> "A gaily-chequered, heart-expanding view,
> Far as the circling eye can shoot around
> Unbounded, tossing in a field of corn."

CHAPTER IV.

STRUCTURE OF BARLEY AND SOME OTHER SEEDS.

Almost at the commencement of our studies, reader, we had occasion, whilst watching the development of the barley plant, to take particular notice of a minute body, the *embryo*, where we found vital activity first manifesting itself, after steeping the grain in cold water for a few hours.

A section of malt at that part of the grain in which this embryo is lodged is given at Plate 5, fig. 9. At *s* are the cells composing the two seed-coats of the grain; at *a* the white mealy portion (albumen), the cells of which have been freed from starch granules in nourishing the embryo; *e* is the embryo. This now consists of three folded leaves, in a rudimentary state, attached to a mass of vegetable matter, in which lie the undeveloped stem and rootlets. Horizontal sections of the embryo (figs. 10, 11), taken from above and below the centre of the embryo, exhibit these parts of its structure very plainly.

Looking at the outside of the base of the grain, on its grooved surface there will be observed a minute, very hard, conical body (Plate 5, *n*, fig. 1), to which, as I have never yet seen any description of it, I have given the name of the *needle.* If the base of the grain, that is, the part by which it was attached to the stalk when in the ear, remains undamaged in threshing, as in fig. 1, and the outer husk of it is removed after being soaked in water for a short time, there will be found lying on the inner coat a peculiarly formed, minute body, which I call the *tuft* (fig. 3, *t*). Separated from the grain, as at fig. 6, it is seen to consist of a central body of a spongy nature, furnished with two long arms, which, when considerably magnified, are resolved into plates of cellular tissue, furnished with innumerable long silky hairs.

Fig. 8 represents a portion of the extremity of one of the arms of the tuft.

From careful observation of many grains of barley, I have found that those which are damaged at their bases (fig. 2), in other words, whose ends are broken, seldom or ever contain the *tuft;* whilst those grains which have been more carefully threshed, and whose ends are perfect, invariably do. In examining such grains, after being steeped in water and allowed to dry, either naturally, or by artificial means, I have invariably found the tuft to contain amongst its filaments more or less of moisture, whilst all the rest of the seed is dry. We have then, I believe, in this minute body one of the essential elements for the successful cultivation or growth of the seed; it is, in fact, a true *sucker* to the seed, and when its position relatively to the embryo is considered, there can be little doubt that it fulfils the office of drawing water to the seed; and by the capillary attraction which its numerous delicate filaments offer to that medium, conveys it upwards to bathe the parts immediately surrounding the embryo.

It is well known that barley-seed communicates a strong tinge of its own colour to water in which it is steeped. The *tuft* lies immediately on the inner coat of the seed, and this coat consists of four layers of cells charged with coloured matter. By dissolving this, some peculiar action takes place on the starch of the albumen, by which the first phenomena of life are elicited and maintained. Barley-growers, brewers, maltsters, and distillers, having a special interest in the careful threshing of the grain, would do well, before purchasing samples for use, to examine the percentage of damaged corns it contains by means of a simple lens and a pair of needles.

The uses of the "needle" are not so apparent. It is very hard, highly silicated, and clothed with shorter and less elastic hairs than those on the tuft (Plate 5, fig. 4).

The seed-coats of barley offer some curious points for observation (Plate 6, fig. 13). The outer layers of elongated or fibrous tissue are covered externally with plates of silica, between which minute holes make their appearance, these being probably the points to which the bases of hairs were once attached To these cells succeed four or five rows of broad, tabular cells, which form the outer coat. The inner one is made up of four or five rows of long cells with very thin walls, forming a thin pellicle, which lies on four rows of cells containing much colouring matter. These skins enclose the large, irregularly-shaped cells, forming the albumen in which an abundance of starch is lodged (Plate 5, fig. 12). The silica plates on the outer layer of cells separate at their edges, when the grain swells from moisture (Plate 6, figs. 14, 15).

Cocculus Indicus (Plate 7, figs. 1 and 2).—In most illegal companionship with our malt liquors are frequently found the ground berries of the *Cocculus Indicus*, which possess great stupifying and poisoning power. The plant from which they are produced is a native of Malabar and Eastern Islands of India, and its fruit is imported to us in bags from Bombay, Madras, and Ceylon.

Fig. 1 is a berry of the natural size, of a dark brown colour, and corrugated surface. When examined under the microscope, after careful dissection, its structure may be thus described. The exterior skin is composed of three or four layers of irregularly-shaped cells, with very thick and dark-coloured walls (Fig. 2, *a*), overlying the woody fibres (*b*) which are interlaced in every direction with branching ligneous cells and spiral vessels (*sv*). Underlying these are the double-pointed, channeled, wood cells, lying horizontally, with others interwoven perpendicularly to them (*d*, *g*, *c*) ; and underlying these is a delicate pellicle formed of rows of delicate thin-walled cells (*h*), which enclose the albumen (*e*), here seen full of minute starch grains; at (*f*) are three cells of the albumen freed from starch to exhibit the pores on their surfaces.

Grains of Paradise (Plate 7, figs. 3, 4, 5) find their legitimate use in the pharmacopœia of the veterinary surgeon, but they have been extensively used to give an artificial strength to spirits, beer, wine, and vinegar—a curious perversion, as it seems to us, of the African's favourite spice, with which he seasons his food. Figure 3 represents a grain magnified six diameters. Its surface is rough, and shining reddish brown, the thin end of the corn being of a pale yellow. The outer coloured skin consists of a series of cells, with curiously undulating walls, highly coloured, which overlie a series of thin-walled long cells placed at a right angle to them. To this succeeds the woody portion of the shell, consisting of very short, double-pointed, channeled cells (*d*), amongst which lie the branched ligneous cells (*e*). Amongst the woody fibres occur the large coloured oil reservoirs, or *cysts*, from which some globules of oil or resinous matter have been expelled.

Datura Stramonium (Plate 7, figs. 6 and 7), the seed of the thorn apple, a native of Greece. It is of the same family as the tobacco plant, and, like it, is highly narcotic in its properties. Its legitimate use is in medicine, administered in very minute doses, either as the dried leaf or powdered grain. Death has resulted from smoking the leaves. The seed, when finely powdered, has been frequently used by desperate characters for *hoccussing* or stupefying the intended victim of a robbery, by surreptitiously adding it to his beer at the public-house bar.

Plate 7, fig. 6, is a grain twice the size of nature; fig. 7 is a diagram, viewed superficially, of the structure of the grain. There is an outer pellicle formed of very thin-walled elongated cells (*a*), which overlie the coloured skin (*b*), formed of minute irregular cells with very thick walls. The woody portion (shell) is composed of rows of delicate fibres, placed at right angles to each other (*c*, *d*), and amongst these are numerous *cysts* containing colouring matter (*e*). Two layers of cells (*f*) enclose the square-shaped cells with very thick walls (*g*), containing abundance of starch.

Hop-seed (Plate 8, fig. 26), divested of the thin pellicle that covers it, and which is covered with innumerable grains of *Lupulite*, the bitter principle so valuable to the brewer, is a greyish conical seed (Plate 6, fig. 18). We have here only to treat of its structure, which contrasts very curiously with that of those we have been examining.

An exterior layer of thick-walled cells (1) overlies the short double-pointed channeled cells with woody fibres interlacing them (*w*), which together form the hardened (woody) epiderm of the seed. These form the outer coat (*a*). Immediately underlying these is a thin, bright, green pellicle, formed of layers of minute cells, with bright green contents (3); these rest upon two sets of elongated cells, one with thick, the other with thin walls (4, 5); at right angles to these, as to length, are placed a series of rectangular cells, coloured light brown, which enclose the horny albumen (*c* 7), containing much oil.

CHAPTER V. (Plates 6, 7.)

HOPS AND YEAST.

THE hop, like the barley plant, originally grew wild, and has been brought to its present condition of beauty and fertility, by the care and cultivation which has for years been bestowed upon it, more especially in England. It is classed by botanists amongst a tribe of plants, *Urticaceæ,* taking their name from *Urticadioica* the common stinging-nettle of our hedgerows. Unlike the barley plant, it does not bear what are called perfect flowers, or those which have both stamens and pistil; but these organs are borne by different plants, staminiferous or male, pistiliferous or female.

The seed or nut, when fully ripe, is found at the base of each of the leafy bracts which compose the cones or fruit used by the brewer. These cones are gathered whilst still in a green state, dried on a kiln, and pressed into bags for the market. It is stated that the use of hops in beer was not known until Henry VIII.'s time in 1524, when, the rhyme says,

> "Hops, reformation, bays, and beer,
> Came into England all in one year."

Six years afterwards the same king forbade brewers to put into ale hops and sulphur. In the English laws hops are mentioned for the first time in the fifth year of the reign of Edward VI., that is, in 1552, when some privileges were granted to hop grounds. We may therefore safely presume that they have been carefully cultivated from that time until now, when the best English hops are considered the finest and most delicately flavoured in the world.

The fruit of the plant (technically called *strobilæ*), which is so largely used in brewing, consists of a series of delicate green, semi-transparent bracts, attached to a common stalk (Plate 6, figs. 16, 23), and overlapping at their edges in a very elegant manner.

The seeds (fig. 18) are minute, flattened, conical, berries of a light brown colour ; they are attached to the bases of the bracts, which fold over at their lower edges to afford them additional support; and each inner seed-containing bract is covered by another externally (fig. 23). Attached to the outer seed-coat is a beautiful transparent membrane (figs. 19, 24), and on this lie, in countless numbers, minute golden-coloured oval bodies, which are the *Lupulite* so valuable to the brewer. These granules are abundant on the bracts, especially at their bases, where the seed is lodged ; they are also present in large quantities on the leaves of the plant (Plate 8, fig. 25).

When one of these granules is placed in water under the microscope, and a drop of sulphuric or nitric acid is added, it immediately bursts, and the coloured matter discharged is seen to consist of excessively minute, somewhat spherical, particles of an oily nature, that move freely and with great rapidity amongst each other with a tremulous motion (Plate 6, fig. 22). This peculiar motion may at times be observed in the contents of the granules before they are broken.

The structure of the bracts is identical with that of the membrane, viz. a layer of oblong cells with thick undulating walls (fig. 24), traversed here and there, where veins occur, with delicate spiral vessels and woody fibres. Minute hairs, with tuberculated surfaces, are also present.

A comman practice amongst hop-buyers is to take a small quantity of the dried hop-fruit, place it in the palm of one hand, and with three or four knuckles of the other to chafe and bruise it. The value of the sample is judged of by the aroma it emits, and the sticky, almost resinous stains left upon the hand. This is a rough but effective way of judging both of the number and produce of the lupulite granules by crushing them. Good sound hops will yield about one-sixth part of their weight of these grains; analysed by the chemist they are found to contain, besides a volatile oil, no fewer than thirteen substances, more or less in combination with each other. But it would appear that to the volatile oil, soluble in water and alcohol, and the bitter principle, *lupulite*, the most valuable properties of the fruit are due.

Knowing from observation how carefully the lupulite granules are lodged on the fruit, I have frequently been at the pains of examining the "spent hops" on the refuse heaps at breweries. I have found a large proportion of the granules perfectly intact, that is to say, not burst, or in any way having yielded their contents; and I may safely affirm that, under the present system adopted at most breweries, of boiling hops without any further separation of the leaves of the fruit than such as is effected by that process, *not more than half their lupulite is made available.* I am not aware that any use has been found for hop leaves, but from the abundance of the lupulite granules on them it is reasonable to presume that, with better knowledge, it will be found that they are not amongst the things which should be thrown aside as useless.

There was at one time an interest of a peculiar kind attaching to the hop plant, one pertaining to the pockets of the British public. Every one has seen, at some time or other, the leaves of roses and other trees swarming with quiet, stupid-looking, green insects, familiar to most under the name of "blight;" but called scientifically plant lice or *aphides.* These creatures have not been objects of my own special study, but I will quote a passage or two relating to them from a most interesting book, "The Letters of Rusticus," by Mr. Newman, which contains an admirable description of these minute creatures, and how, by their formidable depredations, they actually at one time controlled a large share of the national exchequer, at the time when the hop duty was levied.

"To this singular tribe belongs the hop fly, an insect which has more rule over the pockets and tempers of mankind than any other; its abundance or scarcity being almost the only criterion of a scarcity or abundance in the crops of hops; and of all articles of merchandise, the hop is consequently the most variable in price. Owing to the interest taken in the crop of hops, much more close attention has been paid to the hop fly than to any other insect, and you find men conversant with its habits who would blush if you were to suppose them possessed of enough natural history to know the name of the commonest beetle or even bird; but let me assure those that there is nothing derogatory to their manhood, their common sense, or their dignity, in knowing something of the works of nature. I never met with an individual who was the worse man for it. I don't go myself the length of some of your contributors, who measure the joints of an insect's *ears*, as Professor Kennie called them. But perhaps even this is necessary to acquire an accurate knowledge of each kind.

"The hop counties are Kent, Sussex, Surrey, Worcester, and Hereford, The produce of these are termed on the market, Kent, Sussex, Farnham, and Worcester hops. The Farnham are invariably the highest priced, and the Sussex the lowest. The Worcester hops never come on the London market, and have a price of their own which is not much influenced by the general price, as no hops are ever, or very rarely indeed, introduced to supply a deficiency of the Worcester crop should that fail. The hop affords scope for the speculator in two ways: first, the hop itself; secondly, the hop duty. The last is the subject of betting to a very large amount annually.

"The old duty on hops is 10*s.* 8*d.* per cent.; the new duty, imposed in 1802, is 12*s.* 7*d.*, making with the fractions 23*s.* 4*d.*; in 1805, 4*s.* 8*d.* per cwt. was reduced, so that the actual duty paid is 18*s.* 8*d.* per cwt. In betting on the duty the old duty is always understood, and so generally adopted is this mode of expressing the probability of a crop by the betted duty, that the common question is, 'What is the duty laid at?' and as the duty falls the price of hops of course rises, and *vice versâ.* This duty is, however, too much guided by a few men in the Borough, who frequently rise and fall it to answer their own purposes; yet, as the day of picking approaches, the near correspondence of the betted duty and the old duty actually paid is truly surprising. In the year 1802, on the 14th of May, the old duty was laid at £100,000; the fly, however, appearing pretty plentifully towards the end of the month, it sunk to £80,000; the fly increased, and by the end of June the duty had gone down to £60,000; by the end of July to £30,000; by the end of August to £22,000, and by the end of December to £14,000; the duty actually paid this year was £15,463 10*s.* 5*d.*

"In 1826 the summer was remarkably dry and hot; we could hardly sleep at night with the sheets on; the thermometer for several nights continued above 70° all the night through; the crop of hops was immense, scarcely a fly was to be found, and the betted duty, which began in May at £120,000, rose to £265,000; the old duty actually paid was £269,331 0*s.* 9*d.*, the gross duty £468,401 16*s.* 1*d.*, being the largest amount (until then) ever known. From this it will appear that in duty alone a little insignificant-looking fly has control over £450,000 annual income to the British Treasury; and supposing the hop grounds of England capable of paying this duty annually, which they certainly are, it is very manifest that in 1825 these creatures were the means of robbing the Treasury of £426,000. This seems a large sum, but it is not one-twentieth part of the sums gained and lost by dealers during the year in question.

"The hop fly makes its first appearance generally about the 12th of May, sometimes two days earlier, but almost invariably between the 10th and the 30th; and it is worth noticing that it usually appears on the same day in the four districts of Kent, Sussex, Farnham and Worcester. It always makes its appearance in the winged state. If the weather is warm, with mild, kind rains, during the last twenty days of May these flies begin to produce young ones, which are very small, and are called *deposit*, or *knits*. These grow very fast, and in a few days become green *lice*, which is merely a larger form of the same animal. These lice very soon begin to breed, and so keep on knits and lice, knits and *lice only*, to so great an extent as to destroy the plant, when they appear to die with it. I have never found that the deposit of the hop fly leaves the plant at all, or ever becomes a fly while there; in this respect differing from the aphis of the rose, guelder-rose, bean, &c. Frequently, when the weather in May has been dry and cold and windy, the fly has been known to leave the plant and entirely disappear, even after remaining several days. The direction of the wind has nothing whatever to do with their first appearance; but in a warm westerly wind they will take flight most readily, and be thus distributed.

"You will never find a plant of any kind infested with the aphis, without also observing a number of ants and lady-birds among them, and also a queer-looking insect like a fat lizard, which is, in fact, the caterpillar of the lady-bird. The connexion of the ants and the aphis is of the most peaceful kind that can be conceived: their object is the honey-dew which the aphis emits; and far from hurting the animal which affords them this pleasant food, they show it the greatest possible attention and kindness, licking it all over with their little tongues, and fondling it and patting it and caressing it with their antennæ in the kindest, prettiest way imaginable. Not so the lady-bird, or its lizard-like caterpillar: these feed on the '*blights*' most voraciously, a single grub clearing a leaf, on which were forty or more, in the course of a day. The perfect lady-bird is a decided enemy to them, but not so formidable a one as the grub. The eggs of the lady-bird may often be seen on the hop-leaf; they are yellow, and five or six in a cluster placed on their ends: these should on no account be destroyed (as is too often the case), but, on the contrary, every encouragement should be given to so decided a friend to the hop-grower."

Such is Mr. Newman's brief and lucid account of the hop fly, and after reading it, one cannot feel surprised that science, applied to the cultivation of the hop, has not as yet supplied the means of subduing this troublesome pest. Of late years, the inability of the hop-growers to pay the duty led to those frequent interviews with the Chancellor of the Exchequer at the Treasury for a further instalment of credit for payment of the duty; which, owing to its variable nature, was finally abandoned.

YEAST.

According to Pereira, it was only in the year 1835 that the true vegetable nature of yeast was determined, by a French chemist, Cagniard-Latour. Until his researches were made into the nature of ferments, strong doubts were entertained whether the plant was not a microscopic infusorium; although so far back as 1680 the great Leeuwenhoek had both figured and described it as a plant.

If a small portion of fresh yeast is placed on a slip of glass under the microscope, and fed with a moderately strong solution of sugar or saccharine matter, such as fresh worts, it will exhibit a singular appearance. It is composed of a series of cells with minute dots or *nuclei* contained within them, and they are so transparent that the cells can be seen through overlying one another. After being in the brewer's worts an hour or so, these cells begin to germinate by a process of budding. In the course of about three hours the younger cells have attained to the dimensions of their parents, and in about eight hours they begin to form into filaments. At the end of three days they become branched.

Turpin states that in the brewing of 14 butts of beer, in which 35 pounds of dried yeast had been used, 212 pounds of new yeast were produced; in other words, the plants had multiplied to 605 times their original quantity, an astonishing increase for the short period occupied in their production.

There is, however, a difference in the appearance between what is known as *top* yeast and *bottom* yeast, when viewed under the microscope. The former consists of large cells, at the extremities of which small ones are developed; it would, therefore, appear to be produced by a process of budding of individual cells. A temperature of 77° appears to be most favourable to its growth. Bottom yeast does not present this appearance of budding, the cells multiplying most rapidly at a temperature between 32° and 48° F.

Ale yeast is generally considered the best and strongest, and is preferred by bakers. Porter yeast is used in distilleries. There is a very curious fact vouched for by the importers of German and Dutch yeast, and that is that mechanical injury kills or destroys it; it is for this reason imported in bags placed in baskets, and if these be allowed to fall violently on the ground the yeast is spoiled. Yeast thus injured may be distinguished by its dark colour; and from being crumbly or powdery, it becomes soft and glutinous, and sticks to the fingers like flour-paste. Its appearance under the microscope remains unaltered.

When yeast, or the yeast plant, is added to a saccharine solution, such as brewers' worts, a singular and violent action takes place, during which the plant multiplies itself, as we have seen, prodigiously. At the same time, the saccharine matter of the worts becomes decomposed during the growth and multiplication of the plant; and its elements, carbon, hydrogen, and oxygen, re-arrange themselves and become alcohol, carbonic acid gas, and water. This process is known as *fermentation*, and requires simply the addition of yeast to a saccharine solution to produce it.

No very satisfactory solution has yet been arrived at of the exact nature of the forces set in motion by the

KING'S COLLEGE LONDON

presence of a plant of the very lowest type of organization when placed in a medium which forms, as it were, its proper food. The chemist can evolve carbonic acid gas from marble, and he can produce water by the combination of its elements, hydrogen and oxygen; but by no process yet known can he combine carbon and hydrogen with oxygen, in proportions to produce alcohol, excepting by the agency of the yeast plant placed in a saccharine solution.

CHAPTER VI.

MALT, BEER, SPIRIT.

Setting aside skill in process of manufacture, malt, beer, and spirits depend for their production mainly on the exertion of the vital forces with which barley and other seeds are endowed, and the peculiar properties of the yeast plant.

I have before spoken of the wonderful vigour exhibited by barley seeds when placed in favourable circumstances. Indeed, we have only to steep the grain in cold water for a few hours to convince ourselves of the change this simple medium is enabled to exert upon it in a short time. The maltster, in converting barley into malt, strives to imitate as closely as possible the natural growth of the seed when placed in soil, and for this purpose he has to supply it with moisture and a certain degree of warmth. The first of these objects is attained by steeping the grain in cold water for about fifty hours, changing the water once during this interval. At the completion of this stage of the process the grain is found to have lost its light colour, to have swollen considerably, and to have become comparatively soft.

The water is next drained from the grain, which is now removed to a four-sided rectangular frame (for the purpose of being charged with duty by the revenue officers) to a depth varying from ten to thirty inches. From this frame it is removed in a few hours to the working floor (a level surface of slate, tiles, or stucco), and laid thick and close so as to preserve the heat evolved by germination, which has now actively commenced. Small white pips will, in a few days, make their appearance at one end of the grain, whilst on its back a raised protuberance underlying the husk will be seen lengthening itself from day to day.

It is now the maltster's special care, by turning the grain on the floor, spreading it thickly or thinly, to regulate its temperature, so as to obtain a thoroughly even growth throughout the floor, a result which is made more certain of attainment by sprinkling the grain with water. When the rootlets extend beyond the grain some half an inch in length, and the plumule extends to about three-fourths of its length (Plate 2, fig. 2) the germination or growth of the grain may be considered sufficiently advanced, and at this stage is arrested by throwing it into a chamber of hot air provided with a tiled floor, perforated with minute holes. The heat of this chamber (the kiln) is maintained by a fire of charcoal, wood, or coke, placed underneath, and is gradually raised as the water escapes from the grain as steam, which finds its way through the roof, usually furnished with a wooden dome, which turns with the wind. In proportion to the briskness of the kiln fire, and the skill with which the grain has been turned during this process of drying, will much of the value of the malt depend.

Pale malt is generally dried at a temperature of 140° to 150° F. The darker kinds, used for highly coloured beer and porter, are known as "*amber*" malt, and "*snapped*" malt, these being obtained by drying at a temperature varying from 185° to 210° F. To produce the latter description of malt the kiln fire is fed with wood only (dry oak or elm being preferred for this purpose), and by increasing the draught of the kiln fire, the flames are made to reach the perforated tiles on which the malt rests. Whilst thus heated, the malt is laid very thin and kept continually stirred by the workmen, and as each grain becomes gradually scorched, the husk bursts with a snapping noise; hence its name. Roasted malt is prepared by roasting the paler descriptions of malt in cylinders before a strong fire, until it becomes black. In this condition it is used merely for giving a dark colour to porter and stout.

In the manufacture of *patent* or crystallized malt, barley of inferior quality is generally used, and the process of malting it is conducted in the same way as for making ordinary malt, excepting that the grain, whilst working on the floor, is more plentifully supplied with water, and the germination of the grain is carried to a greater extent, the process being continued until the future stem extends the whole length of the grain. In some cases it is allowed to grow until it bursts the husk, and extends to the length of half an inch or more beyond it.

The drying apparatus consists of an oven, having closely fitted iron doors. This contains an iron cylinder covered with wire gauze, which is fixed in the oven and so arranged that it can be readily withdrawn for filling or emptying. A rotatory motion is given to the cylinder by means of machinery, and it is so placed that, when at rest, one side of it is exposed to the action of a coke fire placed at one side of the oven. The process of drying consists in charging the cylinder with the germinated barley, allowing ample space for the free motion of the grains; it is then made to rotate on its axis slowly, so that every part of its surface becomes in turn exposed to the action of the fire. The process of drying occupies about three hours, and when successfully conducted the grain is found to have increased in size, and to have assumed a beautiful amber colour; internally the contents have become highly crystalline in structure, possessing a remarkably sweet, aromatic taste. Brewers have found patent malt a valuable addition when used in small quantities with ordinary malt.

Competent authorities state that during the conversion of barley into malt one-fifth of its original weight, or twenty per cent., is lost. Of this two per cent. is dissolved out in the process of steeping the grain, two per cent. more is given off during the early stages of fermentation in the form of carbonic acid gas. In the process of kiln-drying four per cent. loss occurs by the death and falling away of the rootlets, and twelve per cent. more by the evaporation of the moisture which the grain has absorbed. A good sample of barley skilfully worked in malting will yield an increase in bulk of about five per cent.

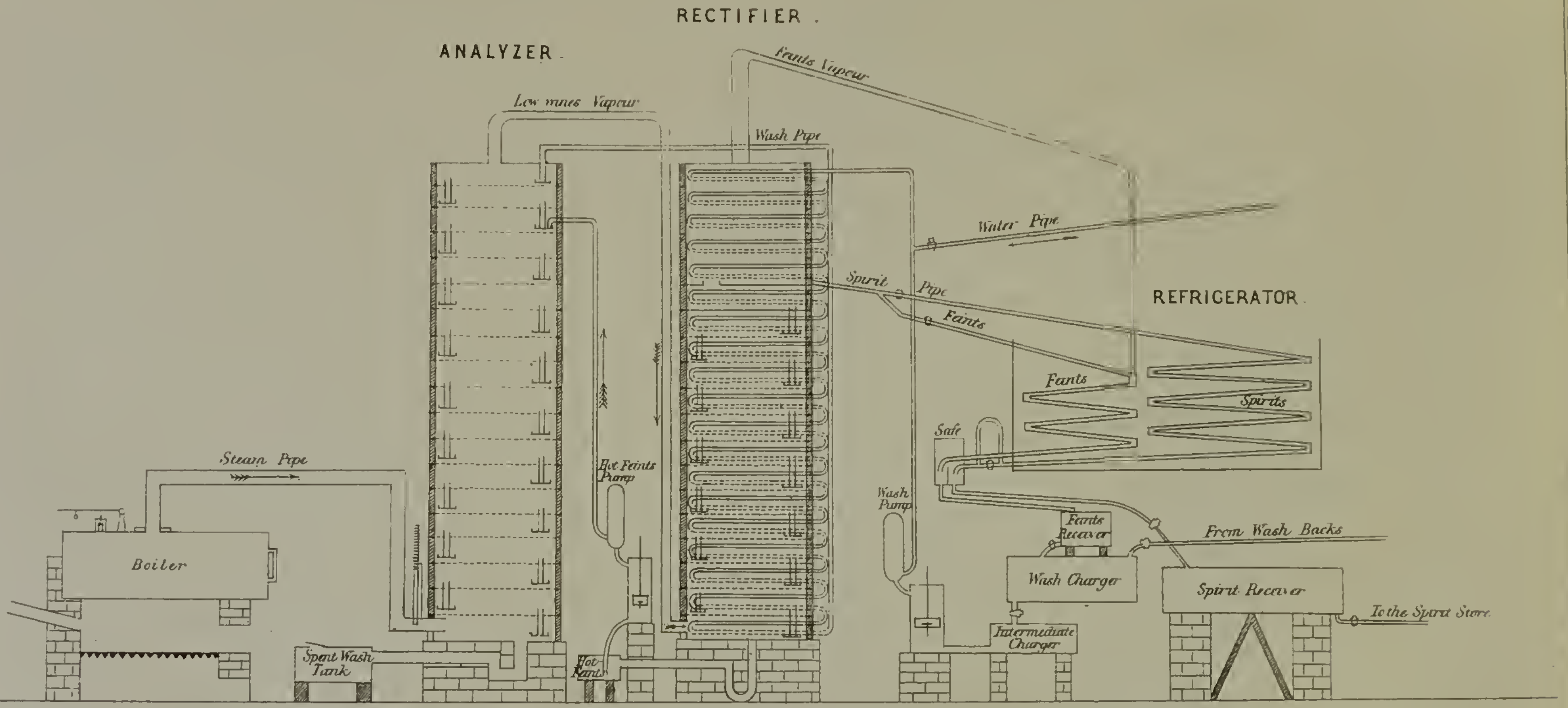
In outward appearance malt differs from barley in the greater fulness of the grains, and by the appearance of a "bloom" upon their outer husks, which replaces the brighter golden hue observable on the grains of barley before being steeped in water. Internally the contents of malt grains should be extremely white and friable, and possess an almost aromatic sweetness; and the ends through which the rootlets once protruded will be found to be distinctly perforated.

The changes brought about in the conversion of barley into malt are best exemplified when malt is crushed and submitted to the action of hot water by the brewer or distiller. Then, instead of the turbid, milky solution which crushed barley yields by this treatment, we have a transparent and sweet solution, perfectly palatable; and it is of this solution, technically called "worts," that the brewer and distiller manufacture "our strong drink."

A peculiar principle, called *diastase*, is evolved in the process of malting barley, and on its production much of the value of malt depends. A part of the starch which barley contains is converted, by the influence of the *diastase*, into grape sugar. And when brought into contact with the meal of other grain, such as oats, &c., in the presence of hot water, diastase has the power of converting the starch of the raw grain also into grape sugar, and it thus saccharizes, or sweetens, the whole mass.

In the manufacture of beer the use of raw grain is prohibited by law, but the brewer obtains his worts, as they are called, by bruising the malt, adding to it hot water at 150° to 180° F., whilst stirring the mixture. To this solution when cold he adds the hops, either in infusion or as they come from the grower, concentrates the whole mixture by boiling, and when sufficiently cooled he adds the yeast as a ferment, and when fermentation has proceeded to a given point he checks it.

The distiller places both crushed malt and crushed grain (oats most frequently) in his mash tun, adds warm water, and keeps the whole thoroughly stirred. When the wort so obtained has sufficiently cooled, which requires to be rapidly done, he dispenses with hops, but adds yeast as a ferment. This fermentation he drives to its utmost limit,—his endeavour being to convert all the saccharine matter of the wort into alcohol, and this alcohol is separated from the wash as it is called by distillation, a process now to be briefly described.



VERTICAL SECTION OF COFFEY'S DISTILLING APPARATUS
WITH THE PRINCIPAL PIPES & VESSELS CONNECTED THEREWITH.

Clay Son & Taylor Litho Bread St Hill E.C.

To face p 50

DISTILLATION.

The ordinary method of distilling Distillers' Wash, and the only one formerly practised, is by boiling it in a closely-covered copper vessel, the head of which is attached to a pipe of considerable length, surrounded by cold water. In this pipe the impure vapour of spirit, called "Low Wines," is condensed in a receiver, and again subjected to the same process to extract the pure spirit. By this process there are four different products obtained by two distillations: in the first, a very impure spirit distils over, known as Low Wines, which has a most nauseous smell and taste. After being collected in a receiver, this is again distilled, the product being a tolerably pure spirit and an essential oil, called Feints; and a fourth product, in not very abundant quantity, Fusel oil.

Of late years the practice of distilling by steam with "Coffey's Apparatus" has become very common; it is a very interesting process, and will be easily understood on reference to the illustration. The apparatus consists essentially of two large upright wooden or iron boxes, divided at intervals into compartments by a series of perforated copper plates (represented by the dotted lines), called the *Analyser* and the *Rectifier*. Each plate of the analyser is, in addition, furnished with a pipe (*p*), inserted into it and rising a few inches above its surface; the other end of it dips into a shallow cup (*c*) on the plate beneath.

The rectifier is similarly furnished with dipping pipes and cups; but, in addition to these, a closed metal pipe of great length is inserted continuously between every compartment by being bent upon itself as it enters each of them.

The wash being in readiness, and the steam in the boiler in sufficient quantity to work at a pressure of from 6 to 7 lbs. to the square inch, the wash is forced, by means of a pump, into the pipe which leads from the *intermediate wash charger* to the top of the rectifier, in the direction of the arrow. It passes through this pipe for its entire length, and through each bend of it, until it at length reaches the top of the analyser, on to which it is discharged. When it has fallen on this plate in sufficient quantity to fill the cup, and has risen to the height of the orifice of the *dipping pipe*, it flows through this to the plate beneath, and so on in succession downwards from plate to plate.

Whilst the flow of wash is thus proceeding in one direction through the metal pipe, steam is let in at the bottom of the analyser, and rises through each perforated plate. Coming in contact with the wash which is on it, the steam combines with the impure spirit of the wash (low wines vapour), and conveys it through the pipe at the top of the analyser down to the bottom of the *rectifier*. Here, in rising, it meets with the surfaces of the pipe containing the descending wash, and as these surfaces are necessarily coldest at the top (because there exposed less to the heating effect of the rising vapour), they act as more powerful condensers than the lower ones in separating the vapour of water from the spirit and the feints. So much of the spirit and feints vapours as are not condensed at the plate to which the spirit pipe is attached are so either at the top of the rectifier from which they fall to the spirit plate, or else pass on as vapour to the refrigerator, where they are condensed into the liquid state and collected in separate vessels. Whilst the process is going on, the feints fall from plate to plate of the rectifier in a condensed state, and are collected through a syphon pipe passing from the bottom of the rectifier to the hot feints receiver. From this vessel they are pumped up through a pipe and discharged nearly on to the top plate of the analyser, and are redistilled from the down-flowing wash, with which they mix. As the wash in the analyser becomes deprived of its spirit, or "spent" as it is called, it passes to the spent-wash tank, from which it is delivered to be used as a useful drink for cows and pigs.

The real merits of this very ingenious contrivance are a saving of time, labour, and fuel, and in addition a more complete separation of the spirit from its impurities and from water. The time and labour attached to a second distillation (the low wines), as in the ordinary still, are both saved, the comparatively low temperature of the wash in the rectifier acts as a refrigerator on the spirit and feints vapours, whilst, on the other hand, the heat of this vapour in the analyser warms the descending wash, and causes it more readily to part with its spirit.

It has the additional merit of separating the spirit from the wash more effectually than by the common method. This is due to the fact that all the wash is brought into contact with the steam in the analyser, and such of the products as are condensed in the rectifier, as "*hot feints*," are again subject to the action of the steam.

Coffey's apparatus is capable of producing spirit with only four and a half per cent. of water mixed with it; and when in good working order can exhaust from two to three thousand gallons of wash per hour, producing a spirit of a uniform strength, ranging from sixty-five to sixty-seven per cent. over-proof.

Mr. Young, of the Inland Revenue, states that "the quantity of spirits which may be produced from the several materials used by distillers depends very much upon the quality of the respective materials; but it may be assumed that, on an average,—

1 quarter of	Barley Malt	will yield	18	gallons at proof.
1 ,,	Malt and Grain	,,	20	,,
1 cwt. of	Sugar	,,	10	,,
1 ,,	Molasses	,,	7	,,
1 ,,	Rice	,,	7½	,,
1 ton of	Beetroot	,,	15	,,

Proof spirit is merely an arbitrary standard of strength, adopted by the Legislature in laying the duty. It means that distilled water at 51° Fahrenheit being considered as unity, an equal measure of proof spirit shall weigh twelve-thirteenths of such water.

The following table will show the quantities of spirit in gallons, at proof, which have been manufactured in the United Kingdom in each year for the last ten years.

Scotch and Irish whiskies, whether made from pure malt, or malt and grain, are the direct product of distilled wash, with water added to decrease their strength. English spirit of similar manufacture is generally used for rectifying or redistilling with *juniper* berries, *carraway* and other seeds, for the production of gin, or for compounding with various ingredients in the manufacture of British brandy and cordials.

SPIRITS.

Accounts for the Ten Years ended 31st March, 1866.

Year ended 31st March.	Quantities of Spirit made in				Quantities of Spirits consumed as Beverage, and Rates of Duty on the same, in							Year ended 31st March.
	England.	Scotland.	Ireland.	United Kingdom.	England.		Scotland.		Ireland.		United Kingdom.	
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Rates of Duty per Gallon.	Gallons.	Rates of Duty per Gallon.	Gallons.	Rates of Duty per Gallon.	Gallons.	
						s. d.		s. d.		s. d.		
1857	8,318,895	12,459,615	8,910,637	29,689,147	11,386,279	8 0	5,368,052	0	6,807,412	6 2	23,561,743	1857
1858	8,228,134	13,349,527	9,857,107	31,434,768	11,634,198	,,	5,575,171	,,	6,783,207	,,	23,992,480	1858
1859	6,784,263	12,747,615	7,670,801	27,202,679	11,860,196	,,	5,324,875	,,	5,418,409	6 2 8 0	22,603,480	1859
1860	7,597,763	13,312,365	7,405,593	28,315,721	12,904,029	8 0 8 1 10 0	5,581,173	8 0 8 1 10 0	5,950,241	8 0 8 1 10 0	26,435,443	1860
1861	7,211,822	11,211,648	4,801,115	23,224,585	11,198,113	10 0	4,250,265	10 0	4,191,560	10 0	19,639,938	1861
1862	7,852,710	12,545,904	4,404,006	24,802,620	10,728,412	,,	4,416,596	,,	4,190,128	,,	19,335,136	1862
1863	7,634,524	13,197,661	4,137,544	24,969,729	10,481,577	,,	4,511,193	,,	3,891,759	,,	18,884,529	1863
1864	7,947,167	13,712,154	4,501,551	26,160,872	10,720,768	,,	4,769,150	,,	3,933,526	,,	19,423,444	1864
1865	7,806,102	14,502,989	5,483,208	27,792,299	11,196,524	,,	5,029,610	,,	4,157,241	,,	20,383,375	1865
1866	7,426,243	13,097,101	5,746,680	26,270,024	11,257,505	,,	5,202,714	,,	4,518,254	,,	20,978,473	1866

CHAPTER VII.

TOBACCO AND SOME OTHER LEAVES.

If the reader has mastered the detail of the foregoing chapters, he will find what follows of some use, should he care to analyse for himself the tobacco which he smokes or chews, or the snuff which he uses.

Most of the tobacco leaves imported into this country arrive packed in large hogsheads, in which after packing they are submitted to an enormous pressure. They rarely suffer any injury in this process, and for purposes of microscopic analysis are, after steeping in water, nearly as useful as if green and freshly plucked. Comparing the margins of any tobacco leaves with those of other plants we shall find them *entire,* that is, even and unbroken (Plate 9, fig. 1), unlike the borders of other leaves cut into toothed notches, or into rounded segments, or into larger segments like the dandelion leaf. American, German, Dutch, and most of the tobacco leaves of commerce are without stalks, being attached to the stem of the plant by the midrib, or large central vein; and this is a very marked character which they possess. So that if we found in our cigar a portion of a leaf, either possessing a stalk or a divided margin, we should safely conclude that we had alighted upon an adulteration.

Moreover, the midrib of tobacco in section presents (as in "bird's-eye" cut tobacco) a horse-shoe form (Plate 9, fig. 5), in which the *woody* or *fibrous* tissue lies as a central mass, surrounded by the cellular tissue. In this latter character it closely resembles foxglove (Plate 10, fig. 5), but this last differs from it in the *woody* tissue being curved upwards at the ends, and the margin of the section, more particularly on its upper surface, having strong and decided curves.

In all the leaves with which tobacco is, or is likely to be adulterated, the woody tissues of their midribs, or stalks, lie in separate detached bundles, as will be readily seen on comparing Plate 9, figs. 8 and 11, and Plate 10, figs. 2, 5, and 8, with Plate 9, fig. 5.

The forms of the leaves of dock (Plate 9, fig. 9), burdock (Plate 9, fig. 6), chicory (Plate 10, fig. 1), foxglove, and comfrey (Plate 10, fig. 4), with the transverse-vertical sections of their midribs, are given in Plates 9 and 10. The peculiar characters of the leaves will be evident on inspection; those of the sections of the midribs consisting of differences in the forms of their outlines, whether plain, more or less grooved or lobed, and the general form and distribution of the woody tissues of each amongst the cellular tissue.

Compare, for instance, the forms of the leaves of burdock and dock (plants growing wild nearly everywhere in Britain, and to be had for the plucking), or either of these, again, with comfrey; and all three with the tobacco leaf. Observe the forms of their bases, points, and margins, and the characteristic distinctions of them will be immediately apparent.

Take a portion of the midrib of each leaf, and cut a very thin slice of it at a right angle to its length, and compare them with each other under the microscope with an object glass of low power. The differences of these will be seen in the general forms of their outlines, whether plain, grooved, or lobed, and the shape and distribution of the *woody* amongst the *cellular* tissues. Notice, more especially, the general outlines and upper surfaces of the midrib sections of *dock* (Plate 9, fig. 11), and *burdock* (Plate 9, fig. 8), and the marked characters which distinguish them from that of *tobacco* (Plate 9, fig. 5) or *comfrey* (Plate 10, fig. 5). Those of *chicory* (Plate 10, fig. 2) and *foxglove* are as decidedly marked.

Carrying our analyses still further, by adding greater power to the microscope, our leaves furnish us with invaluable and infallible evidence in the minute hairs with which their surfaces are clothed, and which, from their delicacy and pliability, elude the grinding action of the snuff-mill. These hairs are attached to, and grow on the skins of the upper and under surfaces of leaves, their midribs and veins, lying scattered in greater or less abundance amongst the *stomates* or breathing-pores of these parts. The tobacco leaf is furnished with two forms of hairs, long and short. The former are composed of three or four elongated cells, joined end to end, the whole surmounted by a cluster of minute cells, forming a *gland* which contains a rich brown colouring matter. These are called *glandular* hairs, and they have a pair, sometimes more, cells forming a compound base. The short hairs are unicellular, with a cluster of cells at one end, also containing colouring matter. I call these hairs club-shaped; their bases are simple (Plate 9, figs. 2, 3, 4).

The leaves of *dock* are furnished with peculiar club-shaped unicellular hairs, free from colouring matter, but having their surfaces marked with peculiar wavy lines (striated), formed by a wrinkling, as it were, of thin cell walls (Plate 9, fig. 10). This is a very marked feature of them; equally so is the presence on the skin of the blade, or thin portion of the leaf, of numerous circular cavities (*glands*), composed of clusters of cells built into the substance of the leaf, forming minute chambers containing crystals of oxalate of lime (raphides) (Plate 9, fig. 12). The hairs described are found mostly on the midribs and veins of the leaves, the *glands* on the leaf-blades.

Leaves of the *burdock* plant are covered on their under surfaces with a dense, greenish-white, woolly substance. When a minute portion of the skin to which this is attached is separated from the leaf, this woolliness is resolved by the microscope into a mass of very beautiful transparent hairs, each composed of a string, or bead, of square-shaped cells, joined together; these gradually diminish in size towards the end of the hair, which terminates in a slender, transparent filament of very great length. The bases of these hairs are compound (Plate 9, fig. 7).

The leaves of the *chicory* plant have a peculiar interest in connexion with the subject of tobacco adulteration. Some years ago, tons of these leaves steeped in tar oil were seized in Ireland by the revenue officers on the premises of a cigar maker, by whom they had been freely used as "*fillers*" for pure Havannahs, and so good was the sophistication, that many practical men were actually deceived by them. When the leaves were unrolled their margins (Plate 10, fig. 1) at once told a tale, and when their skins were stripped and examined under the microscope they told another, for attached to them were discovered an abundance of minute hairs, as unlike those on the tobacco leaf as could be well imagined. For about a third of its length each hair is composed of a number of oblong cells, laid side to side, and end to end; these gradually lessen in number until they form a row of single cells joined together, the hair being finished by a single cell, curiously curved. A cluster of cells form a compound base to each hair (Plate 10, fig. 3).

Among the simplest forms of hairs are those which form the peculiar down on the under surfaces of *foxglove* leaves. They are simple filaments of single oblong cells, joined end to end, ending occasionally with a single oval cell, perfectly colourless, but more frequently with one that is slightly curved, like that of chicory. It is, however, readily distinguished from that hair by the form and structure at its base and lower series of cells; but, like it, the *foxglove* hair has a compound base.

Another of our wild plants, *comfrey* (Plate 10, fig. 6), found growing on hedge-banks and in marshy places, is furnished with two forms of hair, both of them very singular in their appearance. On this leaf are a profusion of unicellular hairs, with compound bases, and very sharp points, the whole surface of the hair being wrinkled or striated (as we found in *dock* but much more coarsely). This is the first instance we have seen of a single-celled hair with a compound base, which in this instance is very prominent. The length and sharp point of this hair readily distinguish it from the club-shaped ones of *dock*. The second form of hair on comfrey leaf is also single-celled and curved, ending in a sharp point, which gives it a form somewhat resembling a fish-hook. The surfaces of these hairs are not striated, and their bases are simple.

The leaf of the Jerusalem artichoke furnishes in abundance examples of beautiful compound hairs with recurved points and compound bases; their surfaces being covered with minute warts (Plate 10, fig. 9). The student may usefully compare the horizontal section of the midrib of this leaf; first, with that of chicory, which it most resembles, and, next with those previously illustrated. I think it will be difficult to find amongst natural objects better examples of exquisite gradations of form and structure than these wayside weeds do furnish.

For the purpose of studying the forms and characters of these hairs under the microscope, the epidermis, or skin of the leaf is detached from the main rib of veins on the under side of the leaf by gently cutting it with a very sharp knife-blade, raising the edge of the skin with a pair of delicate forceps, and peeling it off in a lateral direction. Or, if the skin of the leaf-blade is required, by making a slight incision at that point where the blade joins a vein or midrib. The delicate membrane thus obtained is carefully placed in water on a glass slide covered with thin glass, and, if necessary, a drop of caustic potash added to the water by means of a glass rod to remove impurities.

To examine the structure internally, a piece of it is inserted between two pieces of cork ; these are then placed face to face and inserted into the mouth of a glass tube. After moistening the cork with water, thin, transverse, vertical sections may be obtained by using a very sharp razor, or, what is better, one of the fine knives used by surgeons in delicate dissections and operations on the eye.

Sections thus obtained will resemble, according to their thickness, the loosely aggregated cells of the tobacco leaf (Plate 9, fig. 4), or those more compactly arranged, as in the leaf of the hop.

In both these sections the cells containing green colouring matter, the intercellular cavities of the leaf, the external stomates, and the epidermis with hairs attached, are well seen.

Snuff, whether *moist* or *high dried*, should consist of nothing but the tobacco leaves (with or without midribs) in a fairly divided state, being reduced to powder after undergoing the processes of fermentation, and, in the manufacture of high-dried snuff, of roasting.

Starches of the cereals, pea-meal, bran, sawdust of various woods, malt rootlets, fustic, oxides of iron and lead, and ground glass, have formed at various times favourite adulterations with unprincipled tradesmen. In a certain part of Ireland, which shall be nameless, the acorn-cup of a large species of oak, Valonia, growing on the shores of the Mediterranean, have been extensively used in the adulteration of high-dried snuff. It need not be supposed that they were introduced into the country solely for this purpose, their proper application being in the tanner's pit, where they are very valuable. On the principle, I presume, that they would form a difficult ingredient to find a name for, even with a powerful microscope, they were freely used for a time, until detection and punishment put an end to the speculation. I have given a figure of the microscopic structure of the Valonia acorn-cup at Plate 8, fig. 27, and of the hairs with which it is covered externally. It partakes largely of the peculiar characters which distinguish the structure of our fruit-stones, and like them, contains an abundance of very thick walled, porous cells, lying scattered or in masses amongst cellular tissue. No such cells as these exist anywhere in the tobacco leaf or plant, and they are so characteristic as to proclaim at once their nature, if not their exact origin. The hairs are simple hollow filaments, and are occasionally branched.

It is unnecessary, even if space permitted, to allude further to snuff adulterations. It is sufficient to have named them for the purpose of showing the student in what direction to look for the purpose of observing and detecting them.

Any student wishing to gain an elementary knowledge of plant structure, cannot, I think, do better than follow me in this analysis of "Our Strong Drink and Tobacco Smoke."

DESCRIPTIONS OF PLATES.

PLATE I.

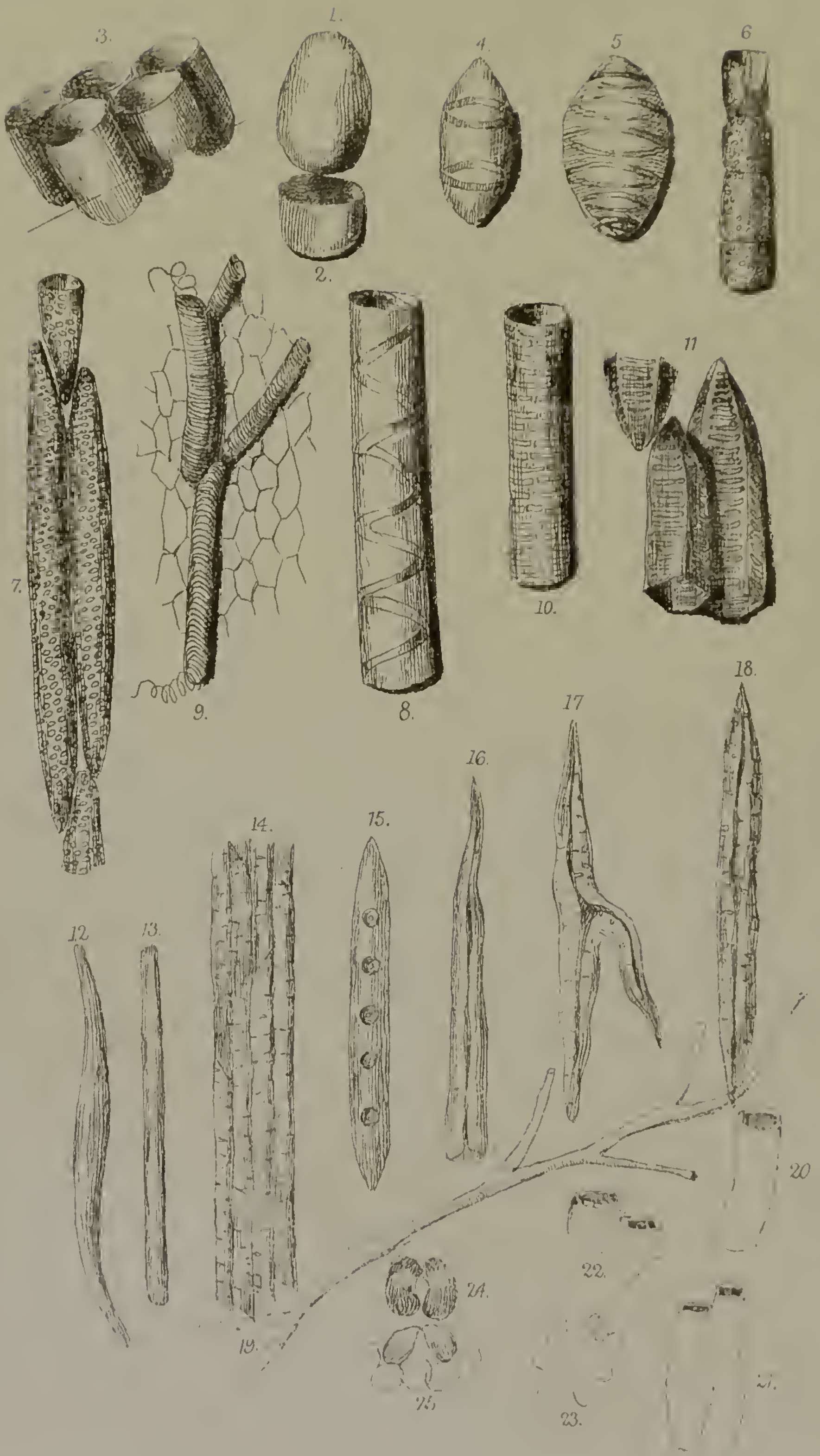


PLATE I.

FIG.

1. A representation in miniature of an inflated sheep bladder.
2. Part of same cut across its length.
3. A collection of same supposed to be held together.
4. A vegetable cell with two rings formed in its interior.
5. Another, with six rings.
6. Four cells super-imposed, united to form a tube.
7. Dotted ducts.
8. A vegetable vessel with deposit formed on its interior in a spiral curve.
9. Spiral vessels from leaf veins.
10. A reticulated vessel.
11. A scalariform duct.
12. A double-pointed wood cell.
13. A square-ended wood cell.
14. A collection of same as *tissue.*
15. A pitted cell from a deal shaving.
16. A part of a single-pointed wood fibre.
17. A branched wood fibre.
18. A pointed ditto.
19. A branched fibre from woody portion of a seed-coat.
20. An oblong cell from skin of leaf.
21. Two irregularly-shaped cells from skin of leaf.
22. Two irregularly-shaped cells from the skin of *Cocculus Indicus.*
23. A cell with wavy outline, from skin of leaf, under side.
24. Kidney-shaped cells from skin of leaf forming a *stoma.*
25. Same viewed in vertical section.

PLATE II.

FIG.

1. A grain of Barley n.s. with the husks removed from lower end to show *the embryo.*

2 to 8. Grains of barley in different stages of development (growth) when placed in moist earth: 4 to 16 days.

9. A diagram of the young barley plant.

10. A young rootlet greatly magnified, showing the *cap* or *sucker.*

11. A young newly-formed leaf with *strap*, *s.*

12. A portion of a fully-developed leaf of barley: *s*, stalk, *st*, strap, *b*, blade.

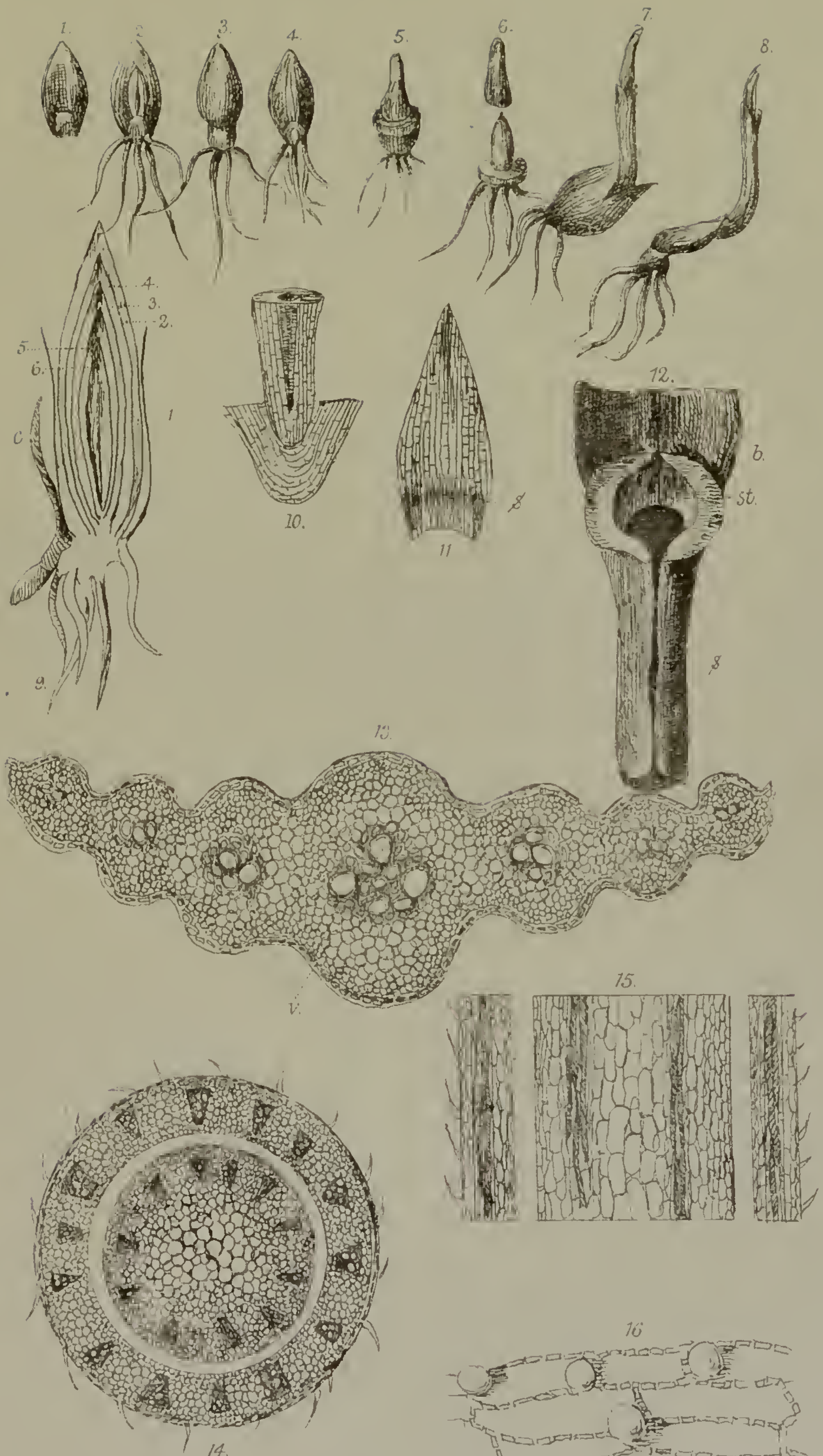
13. A minute portion of a leaf blade cut transverse-vertically and highly magnified, showing the position of the parallel veins (*v*) of the leaf.

14. A horizontal section of barley stem (straw), highly magnified. The inner circle represents a section of the growing point of stem, wood bundles in both.

15. A vertical section of the same.

16. A minute portion of skin of young straw with *hairs* developing, highly magnified.

PLATE 2.



PLATE

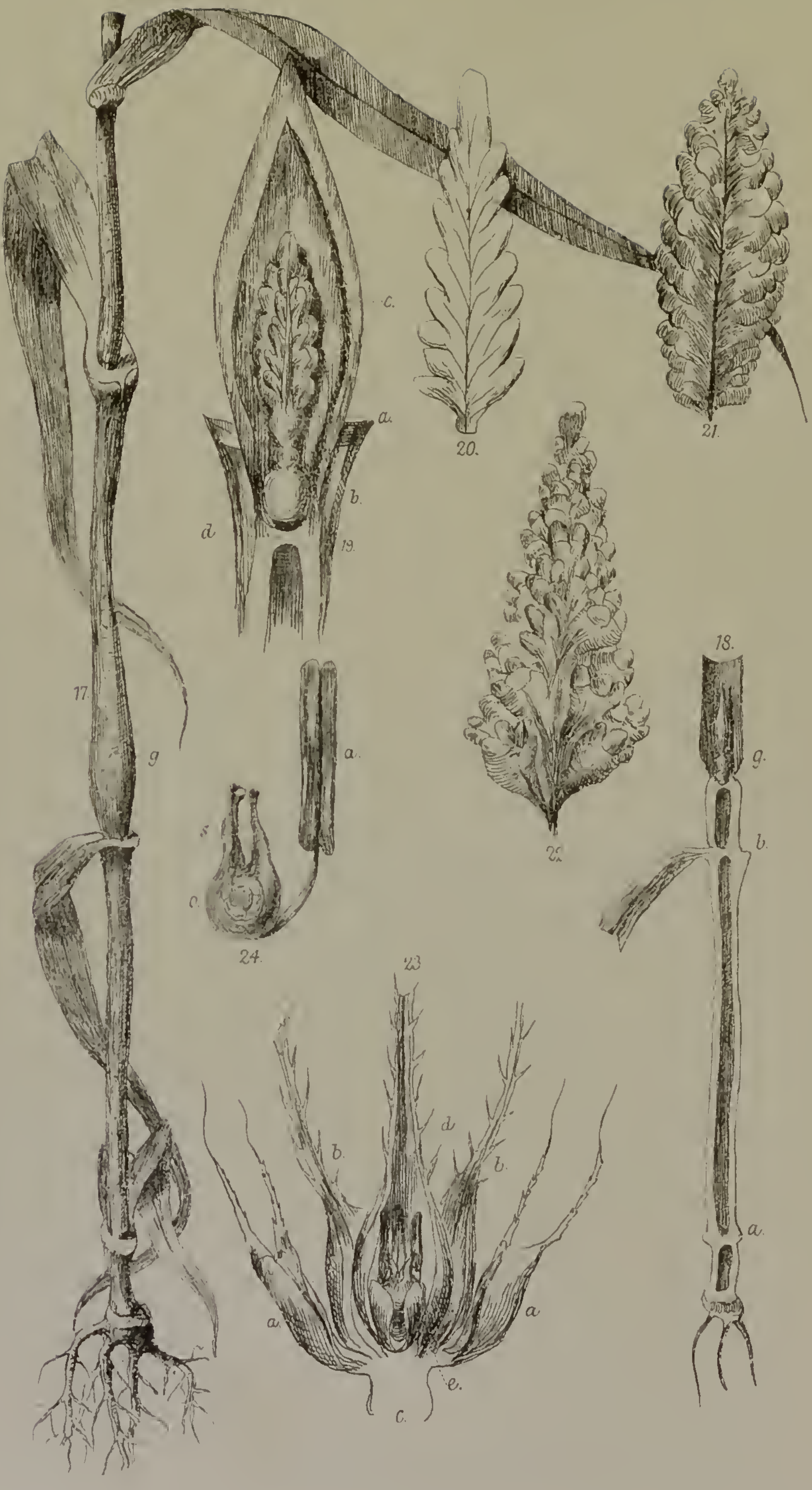


PLATE III.

FIG.

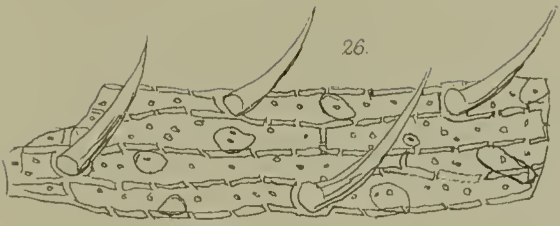
17. A barley plant, n. s. : *g*, swelling caused by contained *inflorescence.*
18. Part of same divided down the centre, showing the size and position of *inflorescence* (*g*) : *a*, and *b*, nodes of the stem.
19. The same highly magnified, showing the divisions of the *inflorescence* into undeveloped (*a*), and developing (*c*) portions : these last will form the future flowers. *b* is the growing point of the stem just separated from the last-formed node.
20. *Inflorescence* in a very rudimentary condition, highly magnified.
21. Further development of same into lobed masses.
22. More advanced *inflorescence :* in which the lobes are seen forming divisions amongst themselves.
23. One of the lobes developed into a perfect flower : *c*, stem, *a a*, lateral florets, *b b d* outer, and *e* inner coats of flower.
24. Ovary (*o*) and one stamen (*a*), separated : *s*, styles with feathery stigmas, on which a pollen granule has fallen.

PLATE IV.

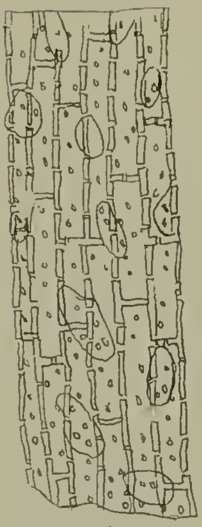
FIG.

25. A vertical section of mature barley straw, highly magnified, showing the dark woody bundles of spiral and other vessels amongst the elongated fibrous cells. The central portion (pith) is not renewed, the stem therefore becomes hollow.
26. A portion of *silicated* epidermis or skin from mature stem, showing the curved prickly hairs, highly magnified.
27. A portion of the epidermis of a leaf without hairs.
28. A minute portion of a very young awn, with spiral vessels (*v*), and (*h*) young hairs developing.
29. A diagram showing the position of the inflorescence relatively to the surrounding leaves: *a*, the oldest leaf; *b c*, those next formed.
30. Portion of (*e*) barley ear, showing the lateral supports (*ss*) by which each grain is protected.
31. *Pollen granules*, enormously magnified.

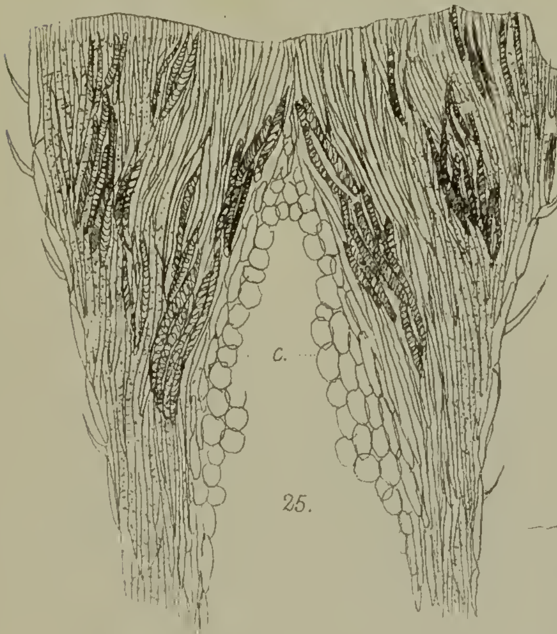
PLATE 4.



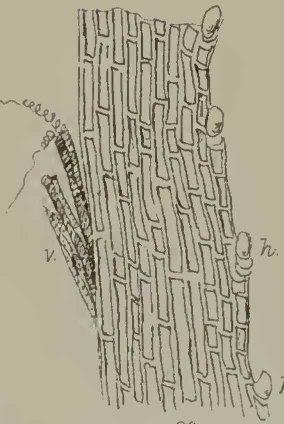
26.



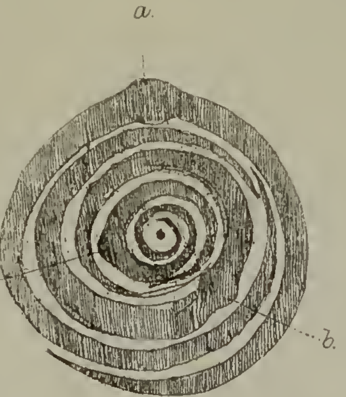
27.



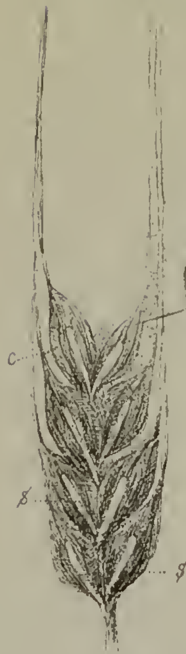
25.



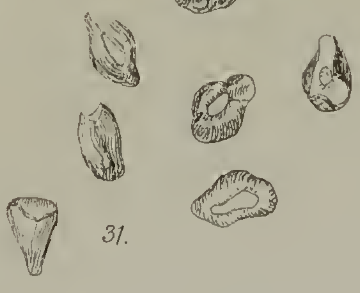
28.



29.



30.



31.

PLATE

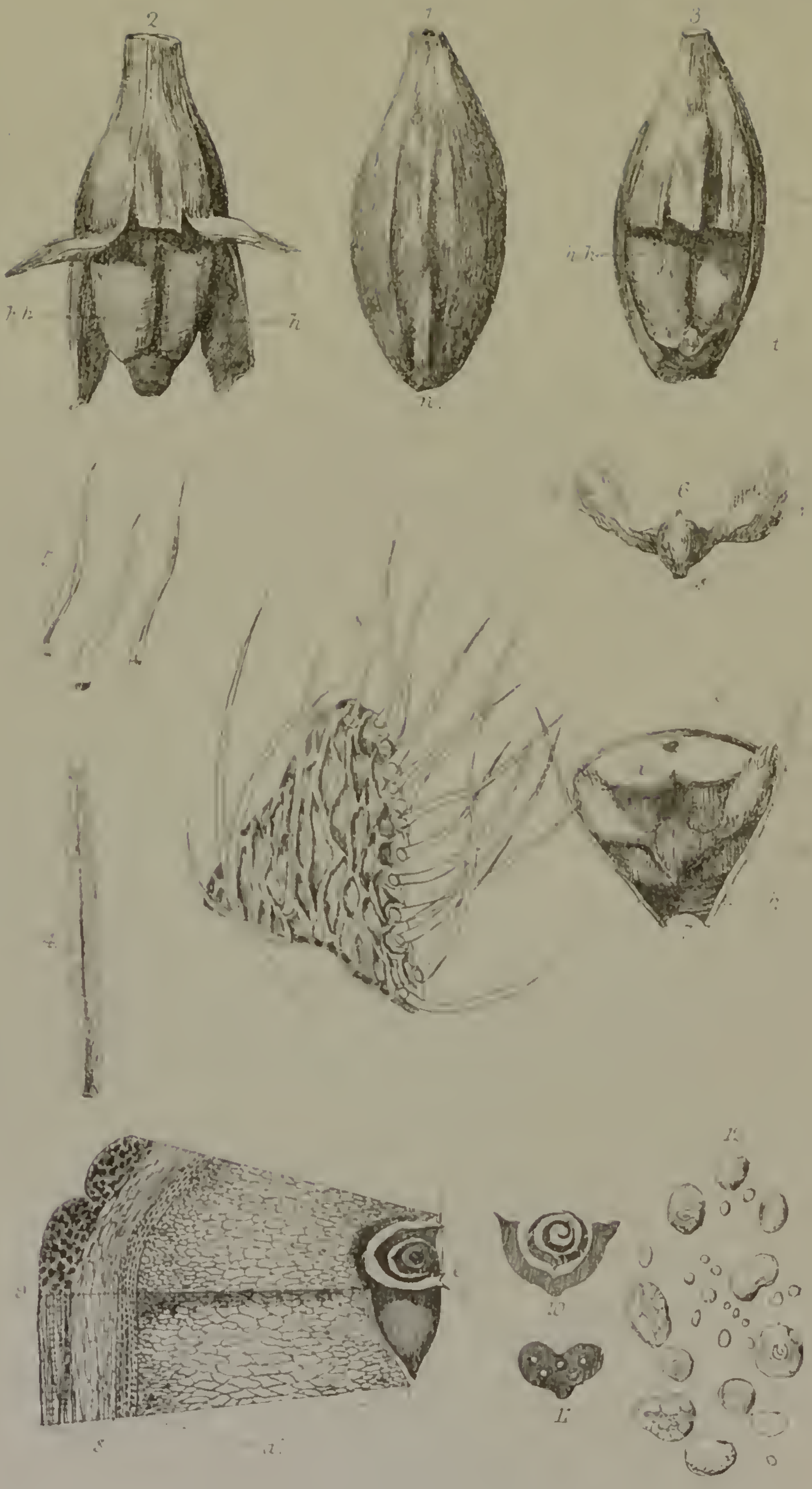


PLATE V.

FIG.

1. A grain of barley greatly magnified, showing the small hard body *n*—the *needle*—at the base of the grain covering the folds of the outer skin.
2. Another (damaged) grain. The outer seed-coat (*h*) has been raised to show the manner in which it separates with force, the central portion being cut away; *hh*, is the inner coat. The "needle" in this specimen was wanting.
3. Another (perfect) grain, in which is present a peculiar minute body overlying the inner coat—*the tuft*, *t*: *h* and *h h* as in previous figure.
4. The *needle*, greatly magnified.
5. Hard silicated hairs from its borders, highly magnified.
6. *The tuft* removed from base of grain: *ww*, wings; *s*, spongiole.
7. The position of the tuft (*t*) relatively to the embryo (*e*) when the grain is cut across: *a*, albumen of the seed; *hh*, outer seed-coat.
8. A minute portion of wing of tuft highly magnified, showing the cellular tissue to which the long delicate filaments are attached.
9. Section of seed through the embryo (*e*), highly magnified: *s*, seed-coats; *a*, albumen deprived of starch.
10. Horizontal section of upper or leaf portion of embryo.
11. Ditto, of portion forming rootlets.
12. Starch granules from albumen of seed, greatly magnified.

PLATE VI.

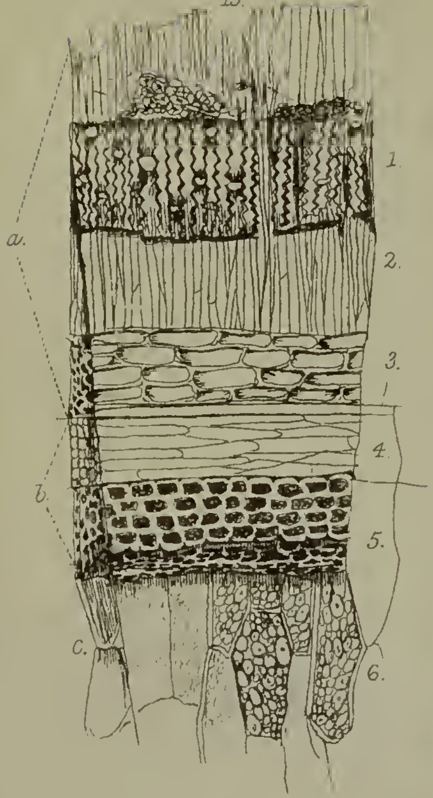
FIG.

13. Seed coats of barley seeds. *a*, the outer one formed of three layers of cells: 1. the tabular silicated cells of the epiderm; 2. the elongated fibrous cells underlying these; 3. the tabular thick-walled cells lying across and under these. *b*, the inner coat, consisting of, 4. a delicate pellicle formed of long very thin-walled cells, overlying four or five rows of cells; 5. with thick walls containing brown colouring matter. 6. *c*, large albumen cells loaded with starch granules.
14. Silica plates on outer layer of cells of skin when dry, highly magnified.
15. The same after the grain has been steeped in water for some time. The dark lines show the separation of the plates owing to the distension of the grain.
16. A *strobile* or fruit of the Hop, n. s.
17. A bract of same highly magnified, showing the position of—
18. The seed at its base, n. s.
19. Seed with investing membrane highly magnified to show the *lupulite*, very abundant on this membrane.

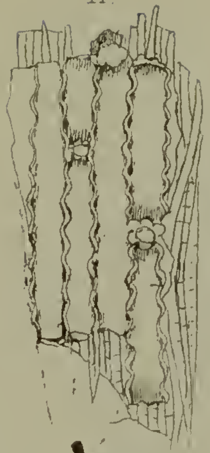
20, 21. Seed divested of membrane viewed in face and on edge.

22. A granule of *lupulite* burst with dilute sulphuric acid.
23. A portion of a fruit of brewer's spent-hops, showing the position of the seeds and lupulite grains unaffected by boiling.
24. A minute portion of the seed pellicle or base of bract (17), beset with lupulite: *s v*, spiral vessels and fibre; *h*, hairs; *c*, cellular tissue in layer, largely magnified.

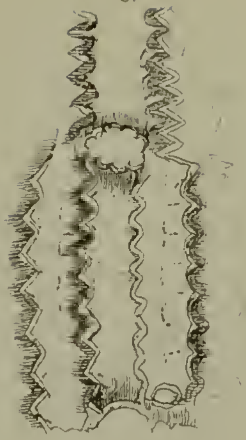
PLATE 6.



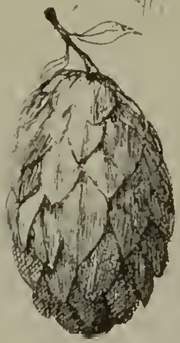
13.



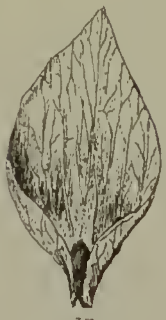
14.



15.



16.



17.

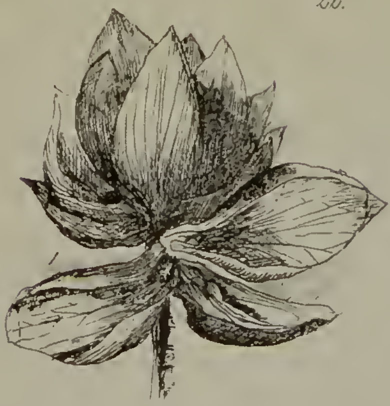
20.

21.

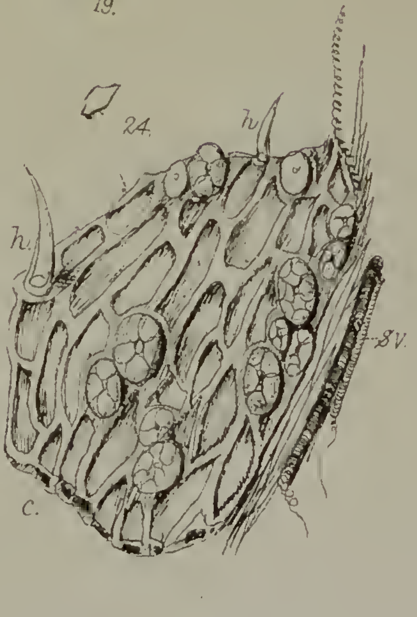
22.

19.

18.



23.



24.

PLATE

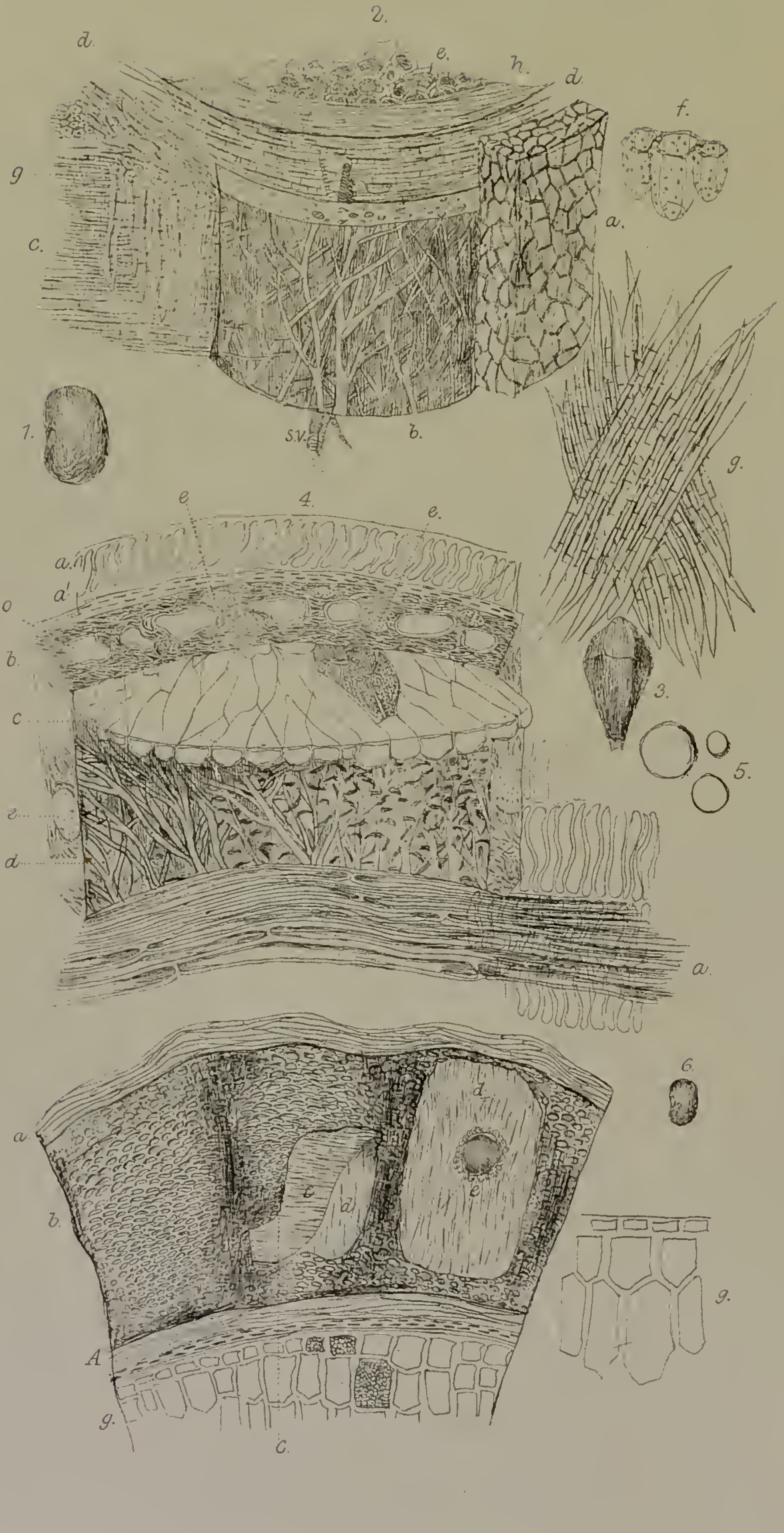


PLATE VII.

FIG.

1. A grain of Cocculus Indicus, n. s.
2. A diagram of the seed constructed from dissections; *a*, the outer skin, composed of irregularly-shaped cells full of dark brown colouring matter in three or four layers overlying; *b*, elongated branching fibrous cells, anastomosing amongst the elongated fibres (*c*) and the cylindrically formed wood cells at *g*: these form the hard or woody portion of the grain, in which are seen at intervals the spiral vessels (*s v*); *d*, layers of double-pointed fibres with thickened walls and lateral channels; *e*, albumen of the seed (cellular), containing much starch; *f*, cells of albumen separated to show their pores.
3. A grain of Paradise, magnified 8 diameters.
4. A diagram of the seed: *a*, the elongated wavy cells of the outer skin, overlying *b*, the woody tissue, amongst which are numerous oil receptacles, *o*: the branched fibres are seen anastomosing amongst these, *e*; *c*, the thin tough-walled cells of the albumen, containing abundance of minute starch granules.
5. Oil globules from the large *cysts* at *b*.
6. A grain of Datura Stramonium, magnified 2 diameters.
7. A horizontal diagram of the seed: *a*, long thin-walled cells of outer seed coat; *b*, layer of thick-walled coloured cells underlying it; *c*, a layer of long delicate cells underlying these, and overlying a layer of same form at a right angle to these; *e*, cyst containing dark brown colouring matter; *f*, a layer of long delicate cells with thin walls, and another of short cells with thick walls firmly attached to albumen (*g*), composed of very thick-walled cells laden with minute starch granules; *g*, cells of albumen very highly magnified.

PLATE VIII.

FIG.

25. A minute portion of a Hop leaf, viewed from its under side as an opaque object, and highly magnified to show the *lupulite* grains.

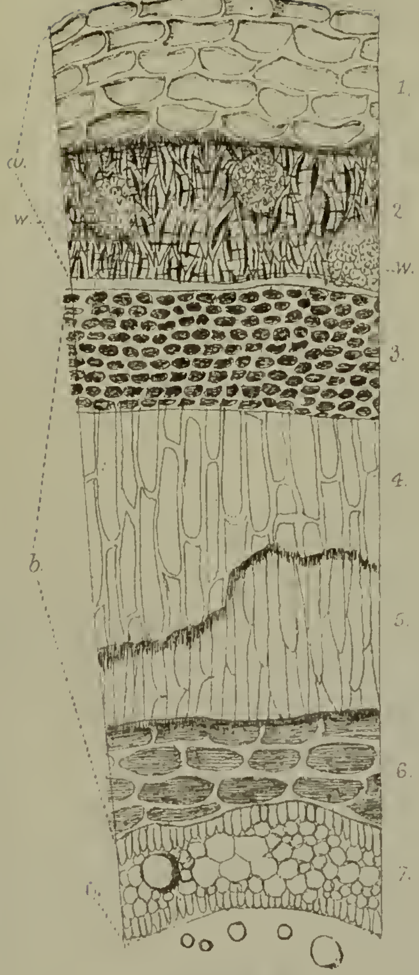
26. The seed of the hop, cut horizontally.
    - *a*, 1. The outer seed coat, consisting of four or five rows of thick-walled cells with irregular outlines.
    - 2. Double-pointed ligneous cells, lined with *sclerogen* and with intercommunicating channels. *w* are the ends of elongated woody fibres, situated at right angles to these.
    - *b*, 3. These thin layers of cells constitute a thin pellicle coloured bright green.
    - 4. A layer of oblong transparent cells.
    - 5. Another layer of thin-walled transparent cells; and at right angles to these, underlying them,—
    - 6. A series of coloured cells with thick walls overlying—
    - *c*, 7. The albumen, containing much oil, here seen in globules forced out of the cells.

27. A small portion of the acorn-cup of the Valonia Oak, magnified, showing the woody cells lined with *sclerogen* (*w*) lying amongst the cellular tissue (*c*); *h h*, are the hairs on the exterior.

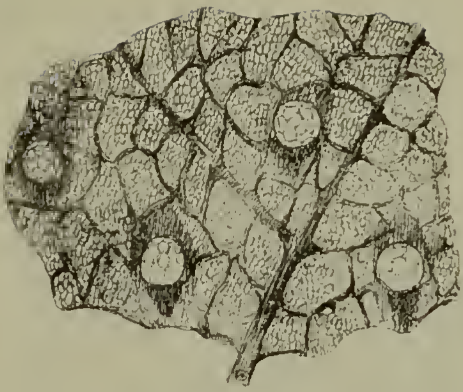
28. A portion of same, highly magnified. *aa.* are groups of large porous cells, which when dissected out are seen to have large intercommunicating channels: fig. 31.

29, 30. Branched and simple hairs, very highly magnified.

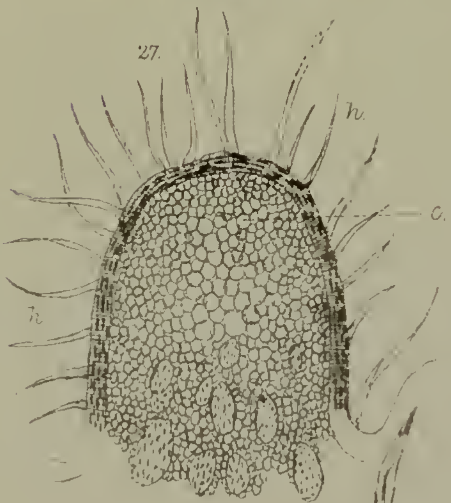
26.

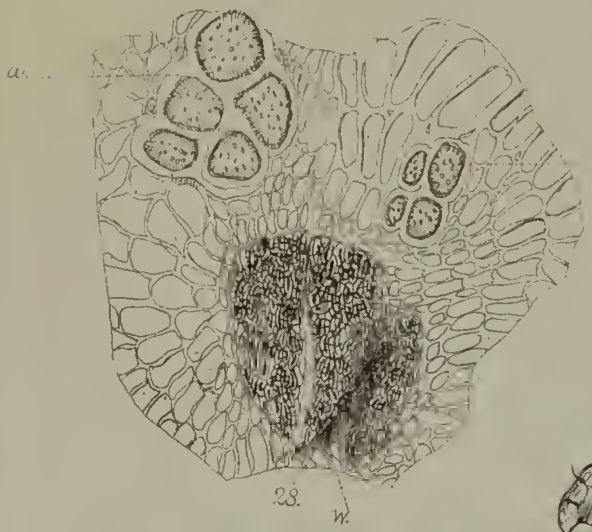


25.



27.

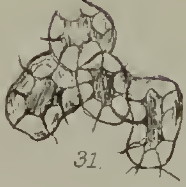




28.

29.

30.



31.

PLATE 9.

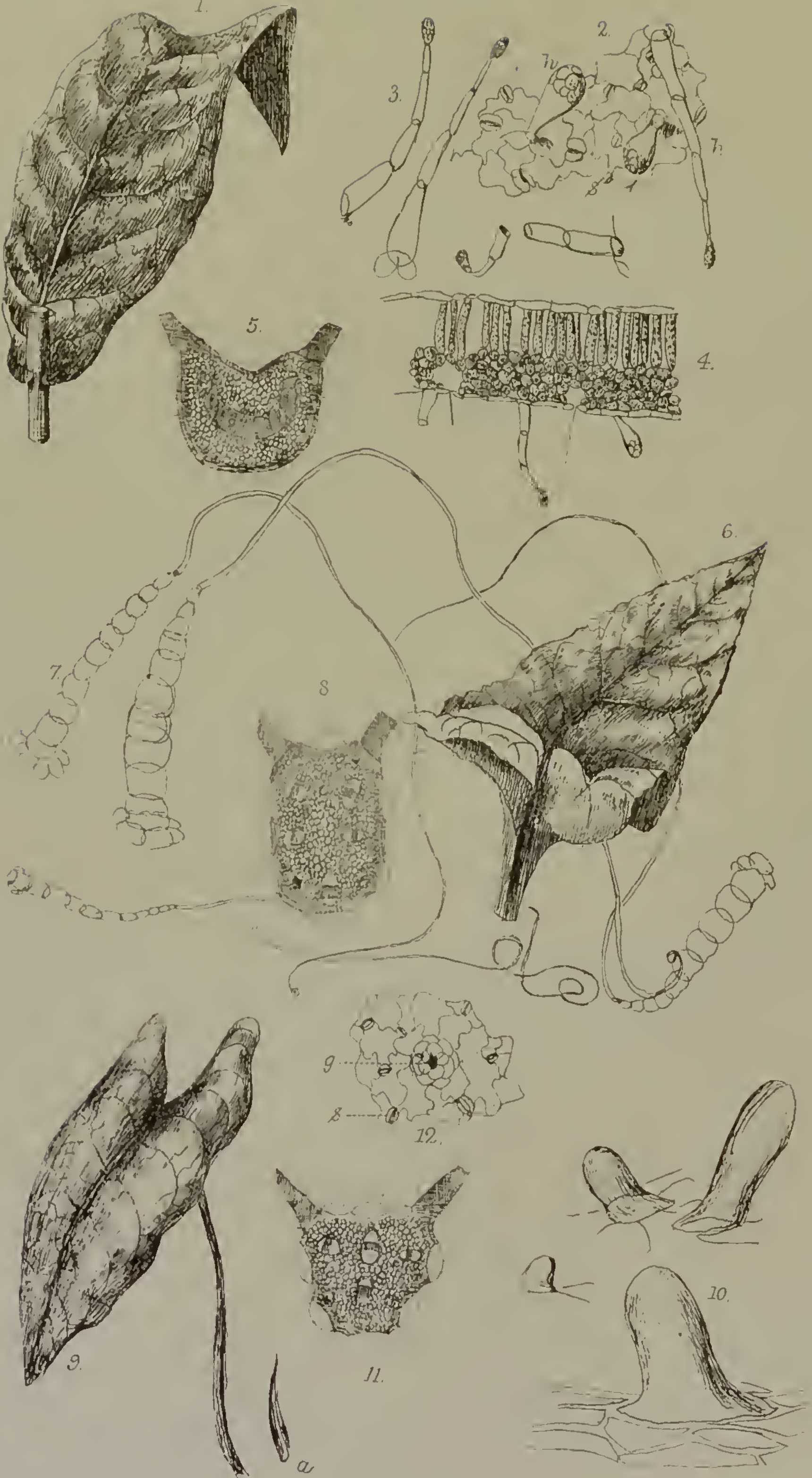


PLATE IX.

FIG.

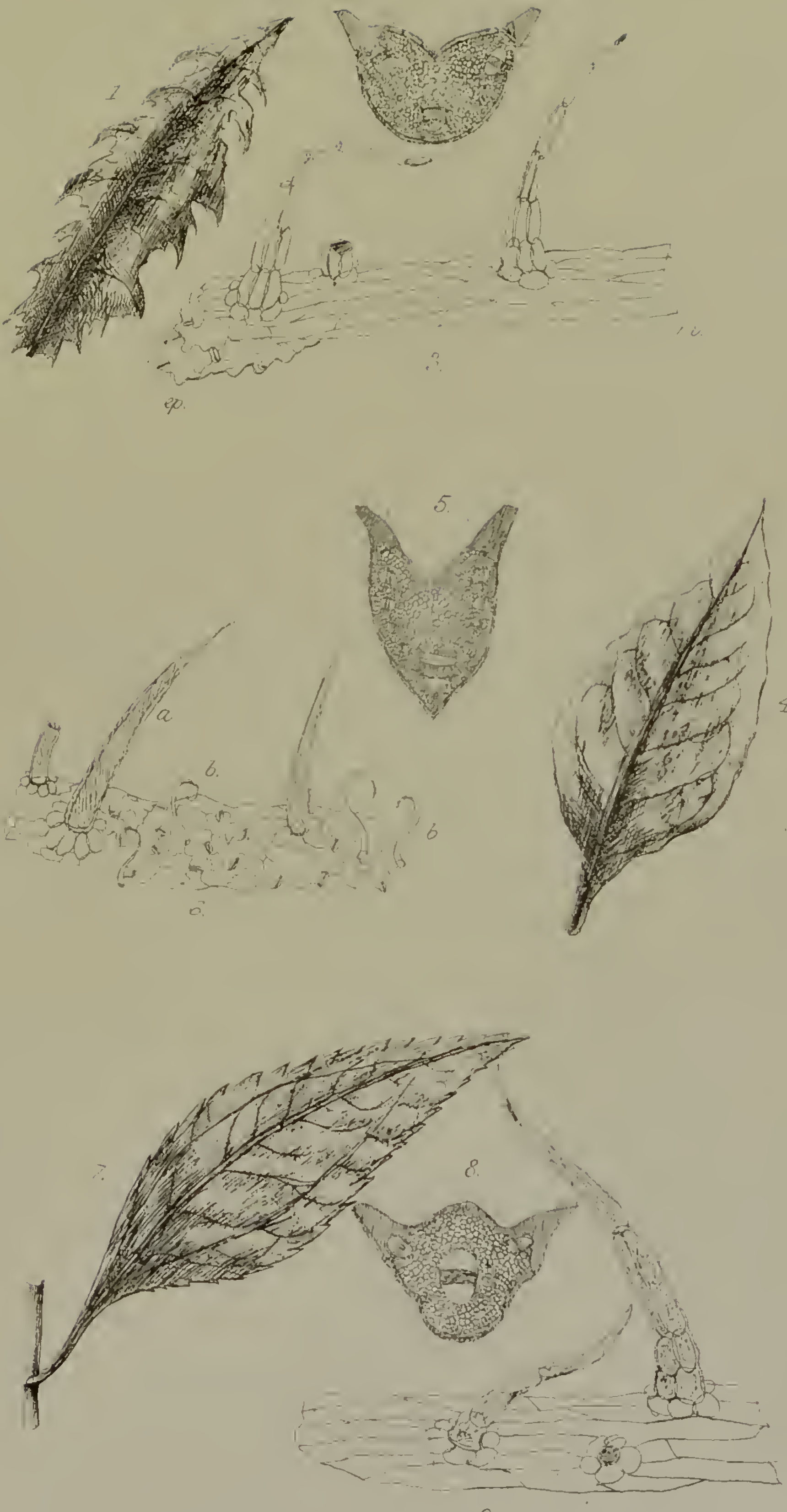
1. A leaf of Virginian Tobacco attached to stem, $\frac{1}{8}$ n. s.
2. Portion of skin from under surface, greatly magnified, to show the two forms of hairs (*h h*) lying amongst the breathing pores, *s*.
3. Hairs separated, and highly magnified.
4. A transverse vertical section of portion of leaf-blade, with hairs and breathing pores on under surface.
5. A horizontal section of midrib of leaf, magnified.
6. A leaf of Burdock, $\frac{1}{8}$ n. s.
7. Hairs from under surface of leaf terminating in long delicate filaments, highly magnified.
8. Horizontal section of midrib of leaf with lobed outline, and bundles of woody fibre separated.
9. Leaf of Dock, $\frac{1}{8}$ n. s.; *a*, the stipule at base of stalk, detached.
10. Club-shaped, striated hairs, from skin of midrib and veins, greatly magnified.
11. Horizontal section of midrib, with lobed surface, and woody bundles separated.
12. A portion of skin of under side of leaf blade, greatly magnified, to show the position of the glands (*g*) amongst the breathing pores (*s*).

PLATE X.

FIG.

1. A leaf of Chicory, $\frac{1}{8}$ n. s.
2. A horizontal section from midrib of leaf, with thin woody bundles.
3. A portion of the skin removed from under side of leaf, greatly magnified to show the hairs on this part.
4. Leaf of Comfrey, $\frac{1}{8}$ n. s.
5. Horizontal section of midrib of leaf, showing the position and character of woody bundles.
6. A minute portion from the skin of the leaf on its under side, with *a*, large curved hairs with striated surfaces; *b b*, hairs formed like fish-hooks: very highly magnified.
7. Leaf of Jerusalem Artichoke, $\frac{1}{8}$ n. s., attached to stem.
8. Horizontal section of midrib of leaf, with woody bundles.
9. Epidermis from under side of leaf, greatly magnified, to show the peculiar form and texture of the hairs.

R. CLAY, SONS, AND TAYLOR, PRINTERS, LONDON.


1
2.
4
ep.
3.
5.
4.
a
b.
b
6.
7.
8.
9.

16, Bedford Street, Covent Garden, London.
December, 1869.

Macmillan & Co.'s General Catalogue of Works in the Departments of History, Biography, Travels, and Belles Lettres, with some short Account or Critical Notice concerning each Book.

SECTION I.

HISTORY, BIOGRAPHY, and TRAVELS.

Baker (Sir Samuel W.).—THE NILE TRIBUTARIES OF ABYSSINIA, and the Sword Hunters of the Hamran Arabs. By Sir Samuel W. Baker, M.A., F.R.G.S. With Portraits, Maps, and Illustrations. Third Edition, 8vo. 21*s*.

Sir Samuel Baker here describes twelve months' exploration, during which he examined the rivers that are tributary to the Nile from Abyssinia, including the Atbara, Settite, Royan, Salaam, Angrab, Rahad, Dinder, and the Blue Nile. The interest attached to these portions of Africa differs entirely from that of the White Nile regions, as the whole of Upper Egypt and Abyssinia is capable of development, and is inhabited by races having some degree of civilization; while Central Africa is peopled by a race of savages, whose future is more problematical.

THE ALBERT N'YANZA Great Basin of the Nile, and Exploration of the Nile Sources. New and cheaper Edition, with Portraits, Maps, and Illustrations. Two vols. crown 8vo. 16*s*.

"*Bruce won the source of the Blue Nile; Speke and Grant won the Victoria source of the great White Nile; and I have been permitted to succeed in completing the Nile Sources by the discovery of the great reservoir of the equatorial waters, the Albert N'yanza, from which the river issues as the entire White Nile.*"—Preface.

Baker (Sir Samuel W.) *(continued)*—

CAST UP BY THE SEA; or, The Adventures of NED GREY. By SIR SAMUEL W. BAKER, M.A., F.R.G.S. Second Edition. Crown 8vo. cloth gilt, 7*s.* 6*d.*

"*A story of adventure by sea and land in the good old style. It appears to us to be the best book of the kind since 'Masterman Ready,' and it runs that established favourite very close.*"—PALL MALL GAZETTE.

"*No book written for boys has for a long time created so much interest, or been so successful. Every parent ought to provide his boy with a copy.*" DAILY TELEGRAPH.

Baxter (R. Dudley, M.A.).—THE TAXATION OF THE UNITED KINGDOM. By R. DUDLEY BAXTER, M.A. 8vo. cloth, 4*s.* 6*d.*

The First Part of this work, originally read before the Statistical Society of London, deals with the Amount of Taxation; the Second Part, which now constitutes the main portion of the work, is almost entirely new, and embraces the important questions of Rating, of the relative Taxation of Land, Personalty, and Industry, and of the direct effect of Taxes upon Prices. The author trusts that the body of facts here collected may be of permanent value as a record of the past progress and present condition of the population of the United Kingdom, independently of the transitory circumstances of its present Taxation.

NATIONAL INCOME. With Coloured Diagrams. 8vo. 3*s.* 6*d.*

PART I.—*Classification of the Population, Upper, Middle, and Labour Classes.* II.—*Income of the United Kingdom.*

"*A painstaking and certainly most interesting inquiry.*"—PALL MALL GAZETTE.

Bernard.—FOUR LECTURES ON SUBJECTS CONNECTED WITH DIPLOMACY. By MOUNTAGUE BERNARD, M.A., Chichele Professor of International Law and Diplomacy, Oxford. 8vo. 9*s.*

Four Lectures, dealing with (1) *The Congress of Westphalia;* (2) *Systems of Policy;* (3) *Diplomacy, Past and Present;* (4) *The Obligations of Treaties.*

Blake.—THE LIFE OF WILLIAM BLAKE, THE ARTIST. By ALEXANDER GILCHRIST. With numerous Illustrations from Blake's designs, and Fac-similes of his studies of the "Book of Job." Two vols. medium 8vo. 32*s.*

These volumes contain a Life of Blake; Selections from his Writings, including Poems; Letters; Annotated Catalogue of Pictures and Drawings; List, with occasional notes, of Blake's Engravings and Writings. There are appended Engraved Designs by Blake: (1) *The Book of Job, twenty-one photo-lithographs from the originals;* (2) *Songs of Innocence and Experience, sixteen of the original Plates.*

Bright (John, M.P.).—SPEECHES ON QUESTIONS OF PUBLIC POLICY. By JOHN BRIGHT, M.P. Edited by Professor THOROLD ROGERS. Two Vols. 8vo. 25*s.* Second Edition, with Portrait.

"*I have divided the Speeches contained in these volumes into groups. The materials for selection are so abundant, that I have been constrained to omit many a speech which is worthy of careful perusal. I have naturally given prominence to those subjects with which Mr. Bright has been especially identified, as, for example, India, America, Ireland, and Parliamentary Reform. But nearly every topic of great public interest on which Mr. Bright has spoken is represented in these volumes.*"

EDITOR'S PREFACE.

AUTHOR'S POPULAR EDITION. Extra fcap. 8vo. cloth. Second Edition. 3*s.* 6*d.*

Bryce.—THE HOLY ROMAN EMPIRE. By JAMES BRYCE, B.C.L., Fellow of Oriel College, Oxford. [*Reprinting.*

CAMBRIDGE CHARACTERISTICS. *See* MULLINGER.

Clay.—THE PRISON CHAPLAIN. A Memoir of the Rev. JOHN CLAY, B.D., late Chaplain of the Preston Gaol. With Selections from his Reports and Correspondence, and a Sketch of Prison Discipline in England. By his Son, the Rev. W. L. CLAY, M.A. 8vo. 15*s.*

"*Few books have appeared of late years better entitled to an attentive perusal. . . . It presents a complete narrative of all that has been done and attempted by various philanthropists for the amelioration of the condition and the improvement of the morals of the criminal classes in the British dominions.*"—LONDON REVIEW.

Cooper.—ATHENÆ CANTABRIGIENSES. By CHARLES HENRY COOPER, F.S.A., and THOMPSON COOPER, F.S.A. Vol. I. 8vo., 1500—85, 18*s.* Vol. II., 1586—1609, 18*s.*

This elaborate work, which is dedicated by permission to Lord Macaulay, contains lives of the eminent men sent forth by Cambridge, after the fashion of Anthony à Wood, in his famous "Athenæ Oxonienses."

Dilke.—GREATER BRITAIN. A Record of Travel in English-speaking Countries during 1866-7. (America, Australia, India.) By Sir CHARLES WENTWORTH DILKE, M.P. Cheap Edition. Crown 8vo. 6*s.*

"*Mr. Dilke has written a book which is probably as well worth reading as any book of the same aims and character that ever was written. Its merits are that it is written in a lively and agreeable style, that it implies a great deal of physical pluck, that no page of it fails to show an acute and highly intelligent observer, that it stimulates the imagination as well as the judgment of the reader, and that it is on perhaps the most interesting subject that can attract an Englishman who cares about his country.*"

SATURDAY REVIEW.

EARLY EGYPTIAN HISTORY FOR THE YOUNG. *See* "JUVENILE SECTION."

Forbes.—LIFE OF PROFESSOR EDWARD FORBES, F.R.S. By GEORGE WILSON, M.D., F.R.S.E., and ARCHIBALD GEIKIE, F.R.S. 8vo. with Portrait, 14*s.*

"*From the first page to the last the book claims careful reading, as being a full but not overcrowded rehearsal of a most instructive life, and the true picture of a mind that was rare in strength and beauty.*"—EXAMINER.

Freeman.—HISTORY OF FEDERAL GOVERNMENT, from the Foundation of the Achaian League to the Disruption of the United States. By EDWARD A. FREEMAN, M.A. Vol. I. General Introduction. History of the Greek Federations. 8vo. 21*s.*

" *The task Mr. Freeman has undertaken is one of great magnitude and importance. It is also a task of an almost entirely novel character. No other work professing to give the history of a political principle occurs to us, except the slight contributions to the history of representative government that is contained in a course of M. Guizot's lectures . . . . The history of the development of a principle is at least as important as the history of a dynasty, or of a race.*' —SATURDAY REVIEW.

French (George Russell).—SHAKSPEAREANA GENEALOGICA. 8vo. cloth extra, 15*s.* Uniform with the "Cambridge Shakespeare."

Part I.—Identification of the dramatis personæ *in the historical plays, from King John to King Henry VIII.; Notes on Characters in Macbeth and Hamlet; Persons and Places belonging to Warwickshire alluded to. Part II.—The Shakspeare and Arden families and their connexions, with Tables of descent. The present is the first attempt to give a detailed description, in consecutive order, of each of the* dramatis personæ *in Shak-*

---

speare's immortal chronicle-histories, and some of the characters have been, it is believed, herein identified for the first time. A clue is furnished which, followed up with ordinary diligence, may enable any one, with a taste for the pursuit, to trace a distinguished Shakspearean worthy to his lineal representative in the present day.

Gladstone (Right. Hon. W. E., M.P.).—JUVENTUS MUNDI. The Gods and Men of the Heroic Age. Crown 8vo. cloth extra. With Map. 10*s.* 6*d.*

This new work of Mr. Gladstone deals especially with the historic element in Homer, expounding that element, and furnishing by its aid a full account of the Homeric men and the Homeric religion. It starts, after the introductory chapter, with a discussion of the several races then existing in Hellas, including the influence of the Phœnicians and Egyptians. It contains chapters on the Olympian system, with its several deities; on the Ethics and the Polity of the Heroic age; on the geography of Homer; on the characters of the Poems; presenting, in fine, a view of primitive life and primitive society as found in the poems of Homer.

"GLOBE" ATLAS OF EUROPE. Uniform in size with Macmillan's Globe Series, containing 45 Coloured Maps, on a uniform scale and projection; with Plans of London and Paris, and a copious Index. Strongly bound in half-morocco, with flexible back, 9*s.*

This Atlas includes all the countries of Europe in a series of 48 *Maps, drawn on the same scale, with an Alphabetical Index to the situation of more than ten thousand places, and the relation of the various maps and countries to each other is defined in a general Key-map. All the maps being on a uniform scale facilitates the comparison of extent and distance, and conveys a just impression of the relative magnitude of different countries. The size suffices to show the provincial divisions, the railways and main roads, the principal rivers and mountain ranges. "This atlas," writes the* British Quarterly, *"will be an invaluable boon for the school, the desk, or the traveller's portmanteau."*

Guizot.—(Author of "JOHN HALIFAX, GENTLEMAN.")—M. DE BARANTE, A Memoir, Biographical and Autobiographical. By M. GUIZOT. Translated by the Author of "JOHN HALIFAX, GENTLEMAN." Crown 8vo. 6*s*. 6*d*.

"*The highest purposes of both history and biography are answered by a memoir so lifelike, so faithful, and so philosophical.*"
BRITISH QUARTERLY REVIEW.

HISTORICAL SELECTIONS. Readings from the best Authorities on English and European History. Selected and arranged by E. M. SEWELL and C. M. YONGE. Crown 8vo. 6*s*.

When young children have acquired the outlines of history from abridgements and catechisms, and it becomes desirable to give a more enlarged view of the subject, in order to render it really useful and interesting, a difficulty often arises as to the choice of books. Two courses are open, either to take a general and consequently dry history of facts, such as Russell's Modern Europe, or to choose some work treating of a particular period or subject, such as the works of Macaulay and Froude. The former course usually renders history uninteresting; the latter is unsatisfactory, because it is not sufficiently comprehensive. To remedy this difficulty, selections, continuous and chronological, have in the present volume been taken from the larger works of Freeman, Milman, Palgrave, and others, which may serve as distinct landmarks of historical reading. "We know of scarcely anything," says the Guardian, *of this volume, "which is so likely to raise to a higher level the average standard of English education."*

Hole.—A GENEALOGICAL STEMMA OF THE KINGS OF ENGLAND AND FRANCE. By the Rev. C. HOLE, M.A., Trinity College, Cambridge. On Sheet, 1*s*.

The different families are printed in distinguishing colours, thus facilitating reference.

Hole (*continued*)—

A BRIEF BIOGRAPHICAL DICTIONARY. Compiled and Arranged by the Rev. CHARLES HOLE, M.A. Second Edition. 18mo. neatly and strongly bound in cloth, 4*s*. 6*d*.

One of the most comprehensive and accurate Biographical Dictionaries in the world, containing more than 18,000 *persons of all countries, with dates of birth and death, and what they were distinguished for. Extreme care has been bestowed on the verification of the dates; and thus numerous errors, current in previous works, have been corrected. Its size adapts it for the desk, portmanteau, or pocket.*

"*An invaluable addition to our manuals of reference, and, from its moderate price, cannot fail to become as popular as it is useful.*"—TIMES.

Hozier.—THE SEVEN WEEKS' WAR; Its Antecedents and its Incidents. By. H. M. HOZIER. With Maps and Plans. Two vols. 8vo. 28*s*.

This work is based upon letters reprinted by permission from "The Times." *For the most part it is a product of a personal eye-witness of some of the most interesting incidents of a war which, for rapidity and decisive results, may claim an almost unrivalled position in history.*

Irving.—THE ANNALS OF OUR TIME. A Diurnal of Events, Social and Political, which have happened in or had relation to the Kingdom of Great Britain, from the Accession of Queen Victoria to the Opening of the present Parliament. By JOSEPH IRVING. 8vo. half-bound. 18*s*.

"*We have before us a trusty and ready guide to the events of the past thirty years, available equally for the statesman, the politician, the public writer, and the general reader. If Mr. Irving's object has been to bring before the reader all the most noteworthy occurrences which have happened since the beginning of Her Majesty's reign, he may justly claim the credit of having done so most briefly, succinctly, and simply, and in such a manner, too, as to furnish him with the details necessary in each case to* *comprehend the event of which he is in search in an intelligent manner. Reflection will serve to show the great value of such a work as this to the journalist and statesman, and indeed to every one who feels an interest in the progress of the age; and we may add that its value is considerably increased by the addition of that most important of all appendices, an accurate and instructive index.*"—TIMES.

Kingsley (Canon).—ON THE ANCIEN REGIME as it Existed on the Continent before the FRENCH REVOLUTION. Three Lectures delivered at the Royal Institution. By the Rev. C. KINGSLEY, M.A., formerly Professor of Modern History in the University of Cambridge. Crown 8vo. 6*s*.

These three lectures discuss severally (1) *Caste*, (2) *Centralization*, (3) *The Explosive Forces by which the Revolution was superinduced. The Preface deals at some length with certain political questions of the present day.*

THE ROMAN AND THE TEUTON. A Series of Lectures delivered before the University of Cambridge. By Rev. C. KINGSLEY, M.A. 8vo. 12*s*.

CONTENTS:—*Inaugural Lecture; The Forest Children; The Dying Empire; The Human Deluge; The Gothic Civilizer; Dietrich's End; The Nemesis of the Goths; Paulus Diaconus; The Clergy and the Heathen: The Monk a Civilizer; The Lombard Laws; The Popes and the Lombards; The Strategy of Providence.*

Latham.—BLACK AND WHITE: a Journal of a Three Months' Tour in the United States. By HENRY LATHAM, M.A., Barrister-at-Law. 8vo. 10*s*. 6*d*.

"*The spirit in which Mr. Latham has written about our brethren in America is commendable in high degree.*"—ATHENÆUM.

Law.—THE ALPS OF HANNIBAL. By WILLIAM JOHN LAW, M.A., formerly Student of Christ Church, Oxford. Two vols. 8vo. 21*s.*

"*No one can read the work and not acquire a conviction that, in addition to a thorough grasp of a particular topic, its writer has at command a large store of reading and thought upon many cognate points of ancient history and geography.*"—QUARTERLY REVIEW.

Liverpool.—THE LIFE AND ADMINISTRATION OF ROBERT BANKS, SECOND EARL OF LIVERPOOL, K.G. Compiled from Original Family Documents by CHARLES DUKE YONGE, Regius Professor of History and English Literature in Queen's College, Belfast; and Author of "The History of the British Navy," "The History of France under the Bourbons," etc. Three vols. 8vo. 42*s.*

Since the time of Lord Burleigh no one, except the second Pitt, ever enjoyed so long a tenure of power; with the same exception, no one ever held office at so critical a time . . . . Lord Liverpool is the very last minister who has been able fully to carry out his own political views; who has been so strong that in matters of general policy the Opposition could extort no concessions from him which were not sanctioned by his own deliberate judgment. The present work is founded almost entirely on the correspondence left behind him by Lord Liverpool, and now in the possession of Colonel and Lady Catherine Harcourt.

"*Full of information and instruction.*"—FORTNIGHTLY REVIEW.

Maclear.—*See Section,* "ECCLESIASTICAL HISTORY."

Macmillan (Rev. Hugh).—HOLIDAYS ON HIGH LANDS; or, Rambles and Incidents in search of Alpine Plants. By the Rev. HUGH MACMILLAN, Author of "Bible Teachings in Nature," etc. Crown 8vo. cloth. 6*s.*

"*Botanical knowledge is blended with a love of nature, a pious enthusiasm, and a rich felicity of diction not to be met with in any works of kindred character, if we except those of Hugh Miller.*"—DAILY TELEGRAPH.

Macmillan (Rev. Hugh), *(continued)*—

FOOT-NOTES FROM THE PAGE OF NATURE. With numerous Illustrations. Fcap. 8vo. 5*s.*

" *Those who have derived pleasure and profit from the study of flowers and ferns—subjects, it is pleasing to find, now everywhere popular—by descending lower into the arcana of the vegetable kingdom, will find a still more interesting and delightful field of research in the objects brought under review in the following pages.*"—PREFACE.

Martin.—THE STATESMAN'S YEAR BOOK FOR 1869. By FREDERICK MARTIN. (Sixth Annual Publication.) A Statistical, Mercantile, and Historical Account of the Civilized World for the Year 1868. Forming a Manual for Politicians and Merchants. Published annually. Crown 8vo. 10*s.* 6*d.*

"*Everybody who knows this work is aware that it is a book that is indispensable to writers, financiers, politicians, statesmen, and all who are directly or indirectly interested in the political, social, industrial, commercial, and financial condition of their fellow-creatures at home and abroad. Mr. Martin deserves warm commendation for the care he takes in making ' The Statesman's Year Book' complete and correct.*"

STANDARD.

Martineau.—BIOGRAPHICAL SKETCHES, 1852—1868. By HARRIET MARTINEAU. Third Edition, with New Preface. Crown 8vo. 8*s.* 6*d.*

A Collection of Memoirs under these several sections :—(1) *Royal*, (2) *Politicians*, (3) *Professional*, (4) *Scientific*, (5) *Social*, (6) *Literary. These Memoirs appeared originally in the columns of the* " Daily News."

Masson (Professor).—ESSAYS, BIOGRAPHICAL AND CRITICAL. *See Section headed* " POETRY AND BELLES LETTRES'

Masson (Professor) (*continued*)—

LIFE OF JOHN MILTON. Narrated in connexion with the Political, Ecclesiastical, and Literary History of his Time. By DAVID MASSON, M.A., LL.D., Professor of Rhetoric at Edinburgh. Vol. I. with Portraits. 8vo. 18*s.* Vol. II. in the Press.

It is intended to exhibit Milton's life in its connexions with all the more notable phenomena of the period of British history in which it was cast—its state politics, its ecclesiastical variations, its literature and speculative thought. Commencing in 1608, *the Life of Milton proceeds through the last sixteen years of the reign of James I., includes the whole of the reign of Charles I. and the subsequent years of the Commonwealth and the Protectorate, and then, passing the Restoration, extends itself to* 1674, *or through fourteen years of the new state of things under Charles II. The first volume deals with the life of Milton as extending from* 1608 *to* 1640, *which was the period of his education and of his minor poems.*

Morison.—THE LIFE AND TIMES OF SAINT BERNARD, Abbot of Clairvaux. By JAMES COTTER MORISON, M.A. New Edition, revised. Crown 8vo. 7*s.* 6*d.*

"*One of the best contributions in our literature towards a vivid, intelligent, and worthy knowledge of European interests and thoughts and feelings during the twelfth century. A delightful and instructive volume, and one of the best products of the modern historic spirit.*"

PALL MALL GAZETTE.

Morley (John).—EDMUND BURKE, a Historical Study. By JOHN MORLEY, B.A. Oxon. Crown 8vo. 7*s.* 6*d.*

"*The style is terse and incisive, and brilliant with epigram and point. It contains pithy aphoristic sentences which Burke himself would not have disowned. But these are not its best features: its sustained power of reasoning, its wide sweep of observation and reflection, its elevated ethical and social tone, stamp it as a work of high excellence, and as such we cordially recommend it to our readers.*"—SATURDAY REVIEW.

Mullinger.—CAMBRIDGE CHARACTERISTICS IN THE SEVENTEENTH CENTURY. By J. B. MULLINGER, B.A. Crown 8vo. 4*s.* 6*d.*

"*It is a very entertaining and readable book.*"—SATURDAY REVIEW.

"*The chapters on the Cartesian Philosophy and the Cambridge Platonists are admirable.*"—ATHENÆUM.

Palgrave.—HISTORY OF NORMANDY AND OF ENGLAND. By Sir FRANCIS PALGRAVE, Deputy Keeper of Her Majesty's Public Records. Completing the History to the Death of William Rufus. Four vols. 8vo. £4 4*s.*

Volume I. General Relations of Mediæval Europe—The Carlovingian Empire—The Danish Expeditions in the Gauls—And the Establishment of Rollo. Volume II. The Three First Dukes of Normandy; Rollo, Guillaume Longue-Épée, and Richard Sans-Peur—The Carlovingian line supplanted by the Capets. Volume III. Richard Sans-Peur—Richard Le-Bon—Richard III.—Robert Le Diable—William the Conqueror. Volume IV. William Rufus—Accession of Henry Beauclerc.

Palgrave (W. G.).—A NARRATIVE OF A YEAR'S JOURNEY THROUGH CENTRAL AND EASTERN ARABIA, 1862–3. By WILLIAM GIFFORD PALGRAVE, late of the Eighth Regiment Bombay N. I. Fourth and cheaper Edition. With Maps, Plans, and Portrait of Author, engraved on steel by Jeens. Crown 8vo. 7*s.* 6*d.*

"*Considering the extent of our previous ignorance, the amount of his achievements, and the importance of his contributions to our knowledge, we cannot say less of him than was once said of a far greater discoverer. Mr. Palgrave has indeed given a new world to Europe.*"—PALL MALL GAZETTE.

Parkes (Henry).—AUSTRALIAN VIEWS OF ENGLAND. By HENRY PARKES. Crown 8vo. cloth. 3*s.* 6*d.*

"*The following letters were written during a residence in England, in the years* 1861 *and* 1862, *and were published in the* Sydney Morning Herald *on the arrival of the monthly mails . . . . On re-perusal, these letters appear to contain views of English life and impressions of English notabilities which, as the views and impressions of an Englishman on his return to his native country after an absence of twenty years, may not be without interest to the English reader. The writer had opportunities of mixing with different classes of the British people, and of hearing opinions on passing events from opposite standpoints of observation.*"—AUTHOR'S PREFACE.

Ralegh.—THE LIFE OF SIR WALTER RALEGH, based upon Contemporary Documents. By EDWARD EDWARDS. Together with Ralegh's Letters, now first collected. With Portrait. Two vols. 8vo. 32*s.*

"*Mr. Edwards has certainly written the Life of Ralegh from fuller information than any previous biographer. He is intelligent, industrious, sympathetic: and the world has in his two volumes larger means afforded it of knowing Ralegh than it ever possessed before. The new letters and the newly-edited old letters are in themselves a boon.*"—PALL MALL GAZETTE.

Robinson (Crabb).—DIARY, REMINISCENCES, AND CORRESPONDENCE OF CRABB ROBINSON. Selected and Edited by Dr. SADLER. With Portrait. Three vols. 8vo. cloth. 36*s.*

Mr. Crabb Robinson's Diary extends over the greater part of three-quarters of a century. It contains personal reminiscences of some of the most distinguished characters of that period, including Goethe, Wieland, De Quincey, Wordsworth (with whom Mr. Crabb Robinson was on terms of great intimacy), Madame de Staël, Lafayette, Coleridge, Lamb, Milman, &c. &c.: and includes a vast variety of subjects, political, literary, ecclesiastical, and miscellaneous.

Rogers (James E. Thorold).—HISTORICAL GLEANINGS: A Series of Sketches. Montague, Walpole, Adam Smith, Cobbett. By Rev. J. E. T. ROGERS. Crown 8vo. 4*s.* 6*d.*

Professor Rogers's object in the following sketches is to present a set of historical facts, grouped round a principal figure. The essays are in the form of lectures.

Smith (Professor Goldwin).—THREE ENGLISH STATESMEN: PYM, CROMWELL, PITT. A Course of Lectures on the Political History of England. By GOLDWIN SMITH, M.A. Extra fcap. 8vo. New and Cheaper Edition. 5*s.*

"*A work which neither historian nor politician can safely afford to neglect.*"—SATURDAY REVIEW.

Tacitus.—THE HISTORY OF TACITUS, translated into English. By A. J. CHURCH, M.A. and W. J. BRODRIBB, M.A. With a Map and Notes. 8vo. 10*s.* 6*d.*

The translators have endeavoured to adhere as closely to the original as was thought consistent with a proper observance of English idiom. At the same time it has been their aim to reproduce the precise expressions of the author. This work is characterised by the Spectator *as "a scholarly and faithful translation."*

Taylor (Rev. Isaac).—WORDS AND PLACES; or Etymological Illustrations of History, Etymology, and Geography. By the Rev. ISAAC TAYLOR. Second Edition. Crown 8vo. 12*s.* 6*d.*

"*Mr. Taylor has produced a really useful book, and one which stands alone in our language.*"—SATURDAY REVIEW.

THE AGRICOLA AND GERMANIA. Translated into English by A. J. CHURCH, M.A. and W. J. BRODRIBB, M.A. With Maps and Notes. Extra fcap. 8vo. 2*s.* 6*d.*

The translators have sought to produce such a version as may satisfy scholars who demand a faithful rendering of the original, and English *readers who are offended by the baldness and frigidity which commonly disfigure translations. The treatises are accompanied by introductions, notes, maps, and a chronological summary. The* Athenæum *says of this work that it is " a version at once readable and exact, which may be perused with pleasure by all, and consulted with advantage by the classical student."*

Trench (Archbishop).—GUSTAVUS ADOLPHUS: Social Aspects of the Thirty Years' War. By R. CHENEVIX TRENCH, D.D., Archbishop of Dublin. Fcap. 8vo. 2*s.* 6*d.*

"*Clear and lucid in style, these lectures will be a treasure to many to whom the subject is unfamiliar.*"—DUBLIN EVENING MAIL.

Trench (Mrs. R).—Edited by ARCHBISHOP TRENCH. Remains of the late MRS. RICHARD TRENCH. Being Selections from her Journals, Letters, and other Papers. New and Cheaper Issue, with Portrait, 8vo. 6*s.*

Contains notices and anecdotes illustrating the social life of the period —extending over a quarter of a century (1799—1827). *It includes also poems and other miscellaneous pieces by Mrs. Trench.*

Trench (Capt. F., F.R.G.S.).—THE RUSSO-INDIAN QUESTION, Historically, Strategically, and Politically considered. By Capt. TRENCH, F.R.G.S. With a Sketch of Central Asiatic Politics and Map of Central Asia. Crown 8vo. 7*s.* 6*d.*

"*The Russo-Indian, or Central Asian question has for several obvious reasons been attracting much public attention in England, in Russia, and also on the Continent, within the last year or two. . . . I have thought that the present volume, giving a short sketch of the history of this question from its earliest origin, and condensing much of the most recent and interesting information on the subject, and on its collateral phases, might perhaps be acceptable to those who take an interest in it.*"—AUTHOR'S PREFACE.

Trevelyan (G.O., M.P.).—CAWNPORE. Illustrated with Plan. By G. O. TREVELYAN, M.P., Author of "The Competition Wallah." Second Edition. Crown 8vo. 6*s.*

"*In this book we are not spared* one fact *of the sad story; but our feelings are not harrowed by the recital of imaginary outrages. It is good for us at home that we have one who tells his tale so well as does Mr. Trevelyan.*"—PALL MALL GAZETTE.

THE COMPETITION WALLAH. New Edition. Crown 8vo. 6*s.*

"*The earlier letters are especially interesting for their racy descriptions of European life in India. . . . Those that follow are of more serious import, seeking to tell the truth about the Hindoo character and English influences, good and bad, upon it, as well as to suggest some better course of treatment than that hitherto adopted.*"—EXAMINER.

Vaughan (late Rev. Dr. Robert, of the British Quarterly).—MEMOIR OF ROBERT A. VAUGHAN. Author of "Hours with the Mystics." By ROBERT VAUGHAN, D.D. Second Edition, revised and enlarged. Extra fcap. 8vo. 5*s.*

"*It deserves a place on the same shelf with Stanley's 'Life of Arnold,' and Carlyle's 'Stirling.' Dr. Vaughan has performed his painful but not all unpleasing task with exquisite good taste and feeling.*"—NONCONFORMIST.

Wallace.—THE MALAY ARCHIPELAGO: the Land of the Orang Utan and the Bird of Paradise. A Narrative of Travels with Studies of Man and Nature. By ALFRED RUSSEL WALLACE. With Maps and Illustrations. Second Edition. Two vols. crown 8vo. 24*s.*

"*A carefully and deliberately composed narrative. . . . We advise our readers to do as we have done, read his book through.*"—TIMES.

Ward (Professor).—THE HOUSE OF AUSTRIA IN THE THIRTY YEARS' WAR. Two Lectures, with Notes and Illustrations. By ADOLPHUS W. WARD, M.A., Professor of History in Owens College, Manchester. Extra fcap. 8vo. 2*s.* 6*d.*

"*Very compact and instructive.*"—FORTNIGHTLY REVIEW.

Warren.—AN ESSAY ON GREEK FEDERAL COINAGE. By the Hon. J. LEICESTER WARREN, M.A. 8vo. 2*s*. 6*d*.

"*The present essay is an attempt to illustrate Mr. Freeman's Federal Government by evidence deduced from the coinage of the times and countries therein treated of.*"—PREFACE.

Wilson.—A MEMOIR OF GEORGE WILSON, M. D., F.R.S.E., Regius Professor of Technology in the University of Edinburgh. By his SISTER. New Edition. Crown 8vo. 6*s*.

"*An exquisite and touching portrait of a rare and beautiful spirit.*"
GUARDIAN.

Wilson (Daniel, LL.D.).—PREHISTORIC ANNALS OF SCOTLAND. By DANIEL WILSON, LL.D., Professor of History and English Literature in University College, Toronto. New Edition, with numerous Illustrations. Two vols. demy 8vo. 36*s*.

This elaborate and learned work is divided into four Parts. Part I. deals with The Primeval or Stone Period : *Aboriginal Traces, Sepulchral Memorials, Dwellings, and Catacombs, Temples, Weapons, &c. &c.; Part II.*, The Bronze Period : *The Metallurgic Transition, Primitive Bronze, Personal Ornaments, Religion, Arts, and Domestic Habits, with other topics ; Part III.*, The Iron Period : *The Introduction of Iron, The Roman Invasion, Strongholds, &c. &c.; Part IV.*, The Christian Period : *Historical Data, the Norrie's Law Relics, Primitive and Mediæval Ecclesiology, Ecclesiastical and Miscellaneous Antiquities. The work is furnished with an elaborate Index.*

PREHISTORIC MAN. New Edition, revised and partly re-written, with numerous Illustrations. One vol. 8vo. 21*s*.

This work, which carries out the principle of the preceding one, but with a wider scope, aims to "view Man, as far as possible, unaffected by those modifying influences which accompany the development of nations and the maturity of a true historic period, in order thereby to ascertain the sources from whence such development and maturity proceed." It contains, for example, chapters on the Primeval Transition ; Speech ; Metals ; the Mound-Builders ; Primitive Architecture ; the American Type ; the Red Blood of the West, &c. &c.

SECTION II.

POETRY AND BELLES LETTRES.

Allingham.—LAWRENCE BLOOMFIELD IN IRELAND; or, the New Landlord. By WILLIAM ALLINGHAM. New and cheaper issue, with a Preface. Fcap. 8vo. cloth, 4*s*. 6*d*.

In the new Preface, the state of Ireland, with special reference to the Church measure, is discussed.

"*It is vital with the national character. . . . It has something of Pope's point and Goldsmith's simplicity, touched to a more modern issue.*"—ATHENÆUM.

Arnold (Matthew).—POEMS. By MATTHEW ARNOLD. Two vols. Extra fcap. 8vo. cloth. 12*s*. Also sold separately at 6*s*. each.

Volume I. contains Narrative and Elegiac Poems; Volume II. Dramatic and Lyric Poems. The two volumes comprehend the First and Second Series of the Poems, and the New Poems.

NEW POEMS. Extra fcap. 8vo. 6*s*. 6*a*.

In this volume will be found "Empedocles on Etna;" "Thyrsis" (written in commemoration of the late Professor Clough); "Epilogue to Lessing's Laocoön;" "Heine's Grave;" "Obermann once more." All these poems are also included in the Edition (two vols.) above-mentioned.

Arnold (Matthew) (*continued*)—

ESSAYS IN CRITICISM. New Edition, with Additions. Extra fcap. 8vo. 6*s*.

CONTENTS :—*Preface ; The Function of Criticism at the present time ; The Literary Influence of Academies ; Maurice de Guerin ; Eugenie de Guerin ; Heinrich Heine ; Pagan and Mediæval Religious Sentiment ; Joubert ; Spinoza and the Bible ; Marcus Aurelius.*

Barnes (Rev. W.).—POEMS OF RURAL LIFE IN COMMON ENGLISH. By the REV. W. BARNES, Author of "Poems of Rural Life in the Dorset Dialect." Fcap. 8vo. 6*s*.

"*In a high degree pleasant and novel. The book is by no means one which the lovers of descriptive poetry can afford to lose.*"—ATHENÆUM.

Bell.—ROMANCES AND MINOR POEMS. By HENRY GLASSFORD BELL. Fcap. 8vo. 6*s*.

"*Full of life and genius.*"—COURT CIRCULAR.

Besant.—STUDIES IN EARLY FRENCH POETRY. By WALTER BESANT, M.A. Crown. 8vo. 8*s*. 6*d*.

A sort of impression rests on most minds that French literature begins with the "siècle de Louis Quatorze;" any previous literature being for the most part unknown or ignored. Few know anything of the enormous literary activity that began in the thirteenth century, was carried on by Rulebeuf, Marie de France, Gaston de Foix, Thibault de Champagne, and Lorris ; was fostered by Charles of Orleans, by Margaret of Valois, by Francis the First ; that gave a crowd of versifiers to France, enriched, strengthened, developed, and fixed the French language, and prepared the way for Corneille and for Racine. The present work aims to afford information and direction touching the early efforts of France in poetical literature.

"*In one moderately sized volume he has contrived to introduce us to the very best, if not to all of the early French poets.*"—ATHENÆUM.

Bradshaw.—AN ATTEMPT TO ASCERTAIN THE STATE OF CHAUCER'S WORKS, AS THEY WERE LEFT AT HIS DEATH. With some Notes of their Subsequent History. By HENRY BRADSHAW, of King's College, and the University Library, Cambridge. [*In the Press.*

Brimley.—ESSAYS BY THE LATE GEORGE BRIMLEY, M.A. Edited by the Rev. W. G. CLARK, M.A. With Portrait. Cheaper Edition. Fcap. 8vo. 3*s.* 6*d.*

Essays on literary topics, such as Tennyson's "Poems," Carlyle's "Life of Stirling," "Bleak House," &c., reprinted from Fraser, *the* Spectator, *and like periodicals.*

Clough (Arthur Hugh).—THE POEMS AND PROSE REMAINS OF ARTHUR HUGH CLOUGH. With a Selection from his Letters and a Memoir. Edited by his Wife. With Portrait. Two vols. crown 8vo. 21*s.* Or Poems separately, as below.

The late Professor Clough is well known as a graceful, tender poet, and as the scholarly translator of Plutarch. The letters possess high interest, not biographical only, but literary—discussing, as they do, the most important questions of the time, always in a genial spirit. The "Remains" include papers on "Retrenchment at Oxford;" on Professor F. W. Newman's book "The Soul;" on Wordsworth; on the Formation of Classical English; on some Modern Poems (Matthew Arnold and the late Alexander Smith), &c. &c.

THE POEMS OF ARTHUR HUGH CLOUGH, sometime Fellow of Oriel College, Oxford. With a Memoir by F. T. PALGRAVE. Second Edition. Fcap. 8vo. 6*s.*

"*From the higher mind of cultivated, all-questioning, but still conservative England, in this our puzzled generation, we do not know of any utterance in literature so characteristic as the poems of Arthur Hugh Clough.*"—FRASER'S MAGAZINE.

Dante.—DANTE'S COMEDY, THE HELL. Translated by W. M. ROSSETTI. Fcap. 8vo. cloth. 5*s.*

"*The aim of this translation of Dante may be summed up in one word —Literality. . . . To follow Dante sentence for sentence, line for line, word for word—neither more nor less—has been my strenuous endeavour.*" —AUTHOR'S PREFACE.

De Vere.—THE INFANT BRIDAL, and other Poems. By AUBREY DE VERE. Fcap. 8vo. 7*s.* 6*d.*

"*Mr. De Vere has taken his place among the poets of the day. Pure and tender feeling, and that polished restraint of style which is called classical, are the charms of the volume.*"—SPECTATOR.

Doyle (Sir F. H.).—Works by Sir FRANCIS HASTINGS DOYLE, Professor of Poetry in the University of Oxford :—

THE RETURN OF THE GUARDS, AND OTHER POEMS. Fcap. 8vo. 7*s.*

"*Good wine needs no bush, nor good verse a preface; and Sir Francis Doyle's verses run bright and clear, and smack of a classic vintage. . . . His chief characteristic, as it is his greatest charm, is the simple manliness which gives force to all he writes. It is a characteristic in these days rare enough.*"—EXAMINER.

LECTURES ON POETRY, delivered before the University of Oxford in 1868. Extra crown 8vo. 3*s.* 6*d.*

THREE LECTURES :—(1) *Inaugural;* (2) *Provincial Poetry;* (3) *Dr. Newman's* "*Dream of Gerontius.*"

"*Full of thoughtful discrimination and fine insight: the lecture on 'Provincial Poetry' seems to us singularly true, eloquent, and instructive.*" SPECTATOR.

Evans.—BROTHER FABIAN'S MANUSCRIPT, AND OTHER POEMS. By SEBASTIAN EVANS. Fcap. 8vo. cloth. 6*s.*

"*In this volume we have full assurance that he has 'the vision and the faculty divine.' . . . Clever and full of kindly humour.*"—GLOBE.

Furnivall.—LE MORTE D'ARTHUR. Edited from the *Harleian* M.S. 2252, in the British Museum. By F. J. FURNIVALL, M.A. With Essay by the late HERBERT COLERIDGE. Fcap. 8vo. 7*s.* 6*d.*

Looking to the interest shown by so many thousands in Mr. Tennyson's Arthurian poems, the editor and publishers have thought that the old version would possess considerable interest. It is a reprint of the celebrated Harleian copy; and is accompanied by index and glossary.

Garnett.—IDYLLS AND EPIGRAMS. Chiefly from the Greek Anthology. By RICHARD GARNETT. Fcap. 8vo. 2*s.* 6*d.*

"*A charming little book. For English readers, Mr. Garnett's translations will open a new world of thought.*"—WESTMINSTER REVIEW.

GUESSES AT TRUTH. By TWO BROTHERS. With Vignette, Title, and Frontispiece. New Edition, with Memoir. Fcap. 8vo. 6*s.*

"*The following year was memorable for the commencement of the 'Guesses at Truth.' He and his Oxford brother, living as they did in constant and free interchange of thought on questions of philosophy and literature and art; delighting, each of them, in the epigrammatic terseness which is the charm of the 'Pensées' of Pascal, and the 'Caractères' of La Bruyère—agreed to utter themselves in this form, and the book appeared, anonymously, in two volumes, in* 1827."—MEMOIR.

Hamerton.—A PAINTER'S CAMP. By PHILIP GILBERT HAMERTON. Second Edition, revised. Extra fcap. 8vo. 6*s.*

BOOK I. *In England;* BOOK II. *In Scotland;* BOOK III. *In France. This is the story of an Artist's encampments and adventures. The headings of a few chapters may serve to convey a notion of the character of the book: A Walk on the Lancashire Moors; the Author his own Housekeeper and Cook; Tents and Boats for the Highlands; The Author encamps on an uninhabited Island; A Lake Voyage; A Gipsy Journey to Glen Coe; Concerning Moonlight and Old Castles; A little French City; A Farm in the Autunois, &c. &c.*

"*His pages sparkle with happy turns of expression, not a few well-told anecdotes, and many observations which are the fruit of attentive study and* *wise reflection on the complicated phenomena of human life, as well as of unconscious nature.*"—WESTMINSTER REVIEW.

Helps.—REALMAH. By ARTHUR HELPS. Two Vols. Crown 8vo. 16*s.*

Of this work, by the Author of "Friends in Council," the Saturday Review *says: "Underneath the form (that of dialogue) is so much shrewdness, fancy, and above all, so much wise kindliness, that we should think all the better of a man or woman who likes the book.*"

Herschel.—THE ILIAD OF HOMER. Translated into English Hexameters. By Sir JOHN HERSCHEL, Bart. 8vo. 18*s.*

A version of the Iliad in English Hexameters. The question of Homeric translation is fully discussed in the Preface.

"*It is admirable, not only for many intrinsic merits, but as a great man's tribute to Genius.*"—ILLUSTRATED LONDON NEWS.

HIATUS: the Void in Modern Education. Its Cause and Antidote. By OUTIS. 8vo. 8*s.* 6*d.*

The main object of this Essay is to point out how the emotional element which underlies the Fine Arts is disregarded and undeveloped at this time so far as (despite a pretence at filling it up) to constitute an Educational Hiatus.

HYMNI ECCLESIÆ. *See* "THEOLOGICAL SECTION."

Kennedy.—LEGENDARY FICTIONS OF THE IRISH CELTS. Collected and Narrated by PATRICK KENNEDY. Crown 8vo. 7*s.* 6*d.*

"*A very admirable popular selection of the Irish fairy stories and legends, in which those who are familiar with Mr. Croker's, and other selections of the same kind, will find much that is fresh, and full of the peculiar vivacity and humour, and sometimes even of the ideal beauty, of the true Celtic Legend.*"—SPECTATOR.

Kingsley (Canon).—*See also* "HISTORIC SECTION," "WORKS OF FICTION," *and* "PHILOSOPHY;" *also* "JUVENILE BOOKS," *and* "THEOLOGY."

THE SAINTS' TRAGEDY: or, The True Story of Elizabeth of Hungary. By the Rev. CHARLES KINGSLEY. With a Preface by the Rev. F. D. MAURICE. Third Edition. Fcap. 8vo. 5*s.*

ANDROMEDA, AND OTHER POEMS. Third Edition. Fcap. 8vo. 5*s.*

PHAETHON; or, Loose Thoughts for Loose Thinkers. Third Edition. Crown 8vo. 2*s.*

Kingsley (Henry).—*See* "WORKS OF FICTION."

Lowell.—UNDER THE WILLOWS, AND OTHER POEMS By JAMES RUSSELL LOWELL. Fcap. 8vo. 6*s.*

"Under the Willows *is one of the most admirable bits of idyllic work, short as it is, or perhaps because it is short, that have been done in our generation.*"—SATURDAY REVIEW.

Masson (Professor).—ESSAYS, BIOGRAPHICAL AND CRITICAL. Chiefly on the British Poets. By DAVID MASSON, LL.D., Professor of Rhetoric in the University of Edinburgh. 8vo. 12*s.* 6*d.*

"*Distinguished by a remarkable power of analysis, a clear statement of the actual facts on which speculation is based, and an appropriate beauty of Language. These essays should be popular with serious men.*"
ATHENÆUM.

BRITISH NOVELISTS AND THEIR STYLES. Being a Critical Sketch of the History of British Prose Fiction. Crown 8vo. 7*s.* 6*d.*

"*Valuable for its lucid analysis of fundamental principles, its breadth of view, and sustained animation of style.*"—SPECTATOR.

Mistral (F.).—MIRELLE: a Pastoral Epic of Provence. Translated by H. CRICHTON. Extra fcap. 8vo. 6*s.*

"*This is a capital translation of the elegant and richly-coloured pastoral epic poem of M. Mistral which, in* 1859, *he dedicated in enthusiastic terms to Lamartine. . . . . . It would be hard to overpraise the sweetness and pleasing freshness of this charming epic.*"—ATHENÆUM.

Myers (Ernest).—THE PURITANS. By ERNEST MYERS. Extra fcap. 8vo. cloth. 2*s.* 6*d.*

"*It is not too much to call it a really grand poem, stately and dignified, and showing not only a high poetic mind, but also great power over poetic expression.*"—LITERARY CHURCHMAN.

Myers (F. W. H.)—ST. PAUL. A Poem. By F. W. H. MYERS. Second Edition. Extra fcap. 8vo. 2*s.* 6*d.*

"*It breathes throughout the spirit of St. Paul, and with a singular stately melody of verse.*"—FORTNIGHTLY REVIEW.

Nettleship.—ESSAYS ON ROBERT BROWNING'S POETRY. By JOHN T. NETTLESHIP. Extra fcap. 8vo. 6*s.* 6*d.*

Noel.—BEATRICE, AND OTHER POEMS. By the Hon. RODEN NOEL. Fcap. 8vo. 6*s.*

"Beatrice *is in many respects a noble poem; it displays a splendour of landscape painting, a strong definite precision of highly-coloured description, which has not often been surpassed.*"—PALL MALL GAZETTE.

Norton.—THE LADY OF LA GARAYE. By the HON. MRS NORTON. With Vignette and Frontispiece. Sixth Edition Fcap. 8vo. 4*s.* 6*d.*

"*There is no lack of vigour, no faltering of power, plenty of passion, much bright description, much musical verse. . . . Full of thoughts well-expressed, and may be classed among her best works.*"—TIMES.

Orwell.—THE BISHOP'S WALK AND THE BISHOP'S TIMES. Poems on the days of Archbishop Leighton and the Scottish Covenant. By ORWELL. Fcap. 8vo. 5*s.*

"*Pure taste and faultless precision of language, the fruits of deep thought, insight into human nature, and lively sympathy.*"—NONCONFORMIST.

Palgrave (Francis T.).—ESSAYS ON ART. By FRANCIS TURNER PALGRAVE, M.A., late Fellow of Exeter College, Oxford. Extra fcap. 8vo. 6*s.*

Mulready—Dyce—Holman Hunt—Herbert—Poetry, Prose, and Sensationalism in Art—Sculpture in England—The Albert Cross, &c.

SHAKESPEARE'S SONNETS AND SONGS. Edited by F. T. PALGRAVE. Gem Edition. With Vignette Title by JEENS. 3*s.* 6*d.*

"*For minute elegance no volume could possibly excel the 'Gem Edition.'*"—SCOTSMAN.

Patmore.—Works by COVENTRY PATMORE :—

THE ANGEL IN THE HOUSE.

BOOK I. *The Betrothal;* BOOK II. *The Espousals;* BOOK III. *Faithful for Ever. With Tamerton Church Tower. Two vols. fcap. 8vo.* 12*s.*

*** *A New and Cheap Edition in one vol.* 18*mo., beautifully printed on toned paper, price* 2*s.* 6*d.*

THE VICTORIES OF LOVE. Fcap. 8vo. 4*s.* 6*d.*

The intrinsic merit of his poem will secure it a permanent place in literature. . . . Mr. Patmore has fully earned a place in the catalogue of poets by the finished idealization of domestic life."—SATURDAY REVIEW.

Rossetti.—Works by CHRISTINA ROSSETTI :—

GOBLIN MARKET, AND OTHER POEMS. With two Designs by D. G. ROSSETTI. Second Edition. Fcap. 8vo. 5*s.*

"*She handles her little marvel with that rare poetic discrimination which neither exhausts it of its simple wonders by pushing symbolism too far, nor keeps those wonders in the merely fabulous and capricious stage. In fact she has produced a true children's poem, which is far more delightful to the mature than to children, though it would be delightful to all.*"—SPECTATOR.

THE PRINCE'S PROGRESS, AND OTHER POEMS. With two Designs by D. G. ROSSETTI. Fcap. 8vo. 6*s.*

"*Miss Rossetti's poems are of the kind which recalls Shelley's definition of Poetry as the record of the best and happiest moments of the best and happiest minds. . . . They are like the piping of a bird on the spray in the sunshine, or the quaint singing with which a child amuses itself when it forgets that anybody is listening.*"—SATURDAY REVIEW.

Rossetti (W. M.).—DANTE'S HELL. *See* "DANTE."

FINE ART, chiefly Contemporary. By WILLIAM M. ROSSETTI. Crown 8vo. 10*s.* 6*d.*

This volume consists of Criticism on Contemporary Art, reprinted from Fraser, The Saturday Review, The Pall Mall Gazette, *and other publications.*

Roby.—STORY OF A HOUSEHOLD, AND OTHER POEMS. By MARY K. ROBY. Fcap. 8vo. 5*s.*

Shairp (Principal).—KILMAHOE, a Highland Pastoral, with other Poems. By JOHN CAMPBELL SHAIRP. Fcap. 8vo. 5*s.*

"*Kilmahoe is a Highland Pastoral, redolent of the warm soft air of the Western Lochs and Moors, sketched out with remarkable grace and picturesqueness.*"—SATURDAY REVIEW.

Smith.—Works by ALEXANDER SMITH :—

A LIFE DRAMA, AND OTHER POEMS. Fcap. 8vo. 2*s.* 6*d.*

CITY POEMS. Fcap. 8vo. 5*s.*

EDWIN OF DEIRA. Second Edition. Fcap. 8vo. 5*s.*

"*A poem which is marked by the strength, sustained sweetness, and compact texture of real life.*"—NORTH BRITISH REVIEW.

Smith.—POEMS. By CATHERINE BARNARD SMITH. Fcap. 8vo. 5*s.*

"*Wealthy in feeling, meaning, finish, and grace; not without passion, which is suppressed, but the keener for that.*"—ATHENÆUM.

Smith (Rev. Walter).—HYMNS OF CHRIST AND THE CHRISTIAN LIFE. By the Rev. WALTER C. SMITH, M.A. Fcap. 8vo. 6*s.*

"*These are among the sweetest sacred poems we have read for a long time. With no profuse imagery, expressing a range of feeling and expression by no means uncommon, they are true and elevated, and their pathos is profound and simple.*"—NONCONFORMIST.

Stratford de Redcliffe (Viscount).—SHADOWS OF THE PAST, in Verse. By VISCOUNT STRATFORD DE REDCLIFFE. Crown 8vo. 10*s.* 6*d.*

"*The vigorous words of one who has acted vigorously. They combine the fervour of politician and poet.*"—GUARDIAN.

Trench.—Works by R. CHENEVIX TRENCH, D.D., Archbishop of Dublin. See also Sections "PHILOSOPHY," "THEOLOGY," &c.

POEMS. Collected and arranged anew. Fcap. 8vo. 7*s.* 6*d.*

ELEGIAC POEMS. Fcap. 8vo. 2*s.* 6*d.*

Trench (Archbishop), *(continued)*—

CALDERON'S LIFE'S A DREAM: The Great Theatre of the World. With an Essay on his Life and Genius. Fcap. 8vo. 4*s.* 6*d.*

HOUSEHOLD BOOK OF ENGLISH POETRY. Selected and arranged, with Notes, by R. C. TRENCH, D.D., Archbishop of Dublin. Extra fcap. 8vo. 5*s.* 6*d.*

This volume is called a "Household Book," by this name implying that it is a book for all—that there is nothing in it to prevent it from being confidently placed in the hands of every member of the household. Specimens of all classes of poetry are given, including selections from living authors. The Editor has aimed to produce a book "which the emigrant, finding room for little not absolutely necessary, might yet find room for in his trunk, and the traveller in his knapsack, and that on some narrow shelves where there are few books this might be one."

"*The Archbishop has conferred in this delightful volume an important gift on the whole English-speaking population of the world.*"—PALL MALL GAZETTE.

SACRED LATIN POETRY, Chiefly Lyrical. Selected and arranged for Use. Second Edition, Corrected and Improved. Fcap. 8vo. 7*s.*

"*The aim of the present volume is to offer to members of our English Church a collection of the best sacred Latin poetry, such as they shall be able entirely and heartily to accept and approve—a collection, that is, in which they shall not be evermore liable to be offended, and to have the current of their sympathies checked, by coming upon that which, however beautiful as poetry, out of higher respects they must reject and condemn—in which, too, they shall not fear that snares are being laid for them, to entangle them unawares in admiration for ought which is inconsistent with their faith and fealty to their own spiritual mother.*"—PREFACE.

Turner.—SONNETS. By the Rev. CHARLES TENNYSON TURNER. Dedicated to his brother, the Poet Laureate. Fcap. 8vo. 4*s.* 6*d.*

"*The Sonnets are dedicated to Mr. Tennyson by his brother, and have, independently of their merits, an interest of association. They both love to write in simple expressive Saxon; both love to touch their imagery in epithets rather than in formal similes; both have a delicate perception of rythmical movement, and thus Mr. Turner has occasional lines which, for phrase and music, might be ascribed to his brother. . . He knows the haunts of the wild rose, the shady nooks where light quivers through the leaves, the ruralities, in short, of the land of imagination.*"—ATHENÆUM.

SMALL TABLEAUX. Fcap. 8vo. 4*s.* 6*d.*

"*These brief poems have not only a peculiar kind of interest for the student of English poetry, but are intrinsically delightful, and will reward a careful and frequent perusal. Full of naïveté, piety, love, and knowledge of natural objects, and each expressing a single and generally a simple subject by means of minute and original pictorial touches, these sonnets have a place of their own.*"—PALL MALL GAZETTE.

Vittoria Colonna.—LIFE AND POEMS. By Mrs. HENRY ROSCOE. Crown 8vo. 9*s.*

The life of Vittoria Colonna, the celebrated Marchesa di Pescara, has received but cursory notice from any English writer, though in every history of Italy her name is mentioned with great honour among the poets of the sixteenth century. "In three hundred and fifty years," says her biographer Visconti, "there has been no other Italian lady who can be compared to her."

"*It is written with good taste, with quick and intelligent sympathy, occasionally with a real freshness and charm of style.*"—PALL MALL GAZETTE.

Webster.—Works by AUGUSTA WEBSTER:—

DRAMATIC STUDIES. Extra fcap. 8vo. 5*s.*

"*A volume as strongly marked by perfect taste as by poetic power.*" NONCONFORMIST.

PROMETHEUS BOUND OF ÆSCHYLUS. Literally translated into English Verse. Extra fcap. 8vo. 3*s.* 6*d.*

"*Closeness and simplicity combined with literary skill.*"—ATHENÆUM.

MEDEA OF EURIPIDES. Literally translated into English Verse. Extra fcap. 8vo. 3*s.* 6*d.*

"*Mrs. Webster's translation surpasses our utmost expectations. It is a photograph of the original without any of that harshness which so often accompanies a photograph.*"—WESTMINSTER REVIEW.

A WOMAN SOLD, AND OTHER POEMS. Crown 8vo. 7*s.* 6*d.*

"*Mrs. Webster has shown us that she is able to draw admirably from the life; that she can observe with subtlety, and render her observations with delicacy; that she can impersonate complex conceptions, and venture into which few living writers can follow her.*"—GUARDIAN.

Woolner.—MY BEAUTIFUL LADY. By THOMAS WOOLNER. With a Vignette by ARTHUR HUGHES. *Third Edition.* Fcap. 8vo. 5*s.*

"*It is clearly the product of no idle hour, but a highly-conceived and faithfully-executed task, self-imposed, and prompted by that inward yearning to utter great thoughts, and a wealth of passionate feeling which is poetic genius. No man can read this poem without being struck by the fitness and finish of the workmanship, so to speak, as well as by the chastened and unpretending loftiness of thought which pervades the whole.*" GLOBE.

WORDS FROM THE POETS. Selected by the Editor of "Rays of Sunlight." With a Vignette and Frontispiece. 18mo. Extra cloth gilt. 2*s.* 6*d.* *Cheaper Edition,* 18mo. limp., 1*s.*

GLOBE EDITIONS.

UNDER the title GLOBE EDITIONS, the Publishers are issuing a uniform Series of Standard English Authors, carefully edited, clearly and elegantly printed on toned paper, strongly bound, and at a small cost. The names of the Editors whom they have been fortunate enough to secure constitute an indisputable guarantee as to the character of the Series. The greatest care has been taken to ensure accuracy of text; adequate notes, elucidating historical, literary, and philological points, have been supplied; and, to the older Authors, glossaries are appended. The series is especially adapted to Students of our national Literature; while the small price places good editions of certain books, hitherto popularly inaccessible, within the reach of all.

Shakespeare.—THE COMPLETE WORKS OF WILLIAM SHAKESPEARE. Edited by W. G. CLARK and W. ALDIS WRIGHT. Ninety-first Thousand. Globe 8vo. 3*s.* 6*d.*

"*A marvel of beauty, cheapness, and compactness. The whole works—plays, poems, and sonnets—are contained in one small volume: yet the page is perfectly clear and readable. . . . For the busy man, above all for the working Student, the Globe Edition is the best of all existing Shakespeare books.*"—ATHENÆUM.

Morte D'Arthur.—SIR THOMAS MALORY'S BOOK OF KING ARTHUR AND OF HIS NOBLE KNIGHTS OF THE ROUND TABLE. The Edition of CAXTON, revised for Modern Use. With an Introduction by SIR EDWARD STRACHEY, Bart. Globe 8vo. 3*s*. 6*d*. Third Edition.

"*It is with the most perfect confidence that we recommend this edition of he old romance to every class of readers.*"—PALL MALL GAZETTE.

Scott.—THE POETICAL WORKS OF SIR WALTER SCOTT. With Biographical Essay, by F. T. PALGRAVE. Globe 8vo. 3*s*. 6*d*.

"*As a popular edition it leaves nothing to be desired. The want of such an one has long been felt, combining real excellence with cheapness.*" SPECTATOR.

Burns.—THE POETICAL WORKS AND LETTERS OF ROBERT BURNS. Edited, with Life, by ALEXANDER SMITH. Globe 8vo. 3*s*. 6*d*.

"*The works of the bard have never been offered in such a complete form in a single volume.*"—GLASGOW DAILY HERALD.

"*Admirable in all respects.*"—SPECTATOR.

Robinson Crusoe.—THE ADVENTURES OF ROBINSON CRUSOE. By DEFOE. Edited, from the Original Edition, by J. W. CLARK, M.A., Fellow of Trinity College, Cambridge. With Introduction by HENRY KINGSLEY. Globe 8vo. 3*s*. 6*d*.

"*The Globe Edition of Robinson Crusoe is a book to have and to keep. It is printed after the original editions, with the quaint old spelling, and is published in admirable style as regards type, paper, and binding. A well-written and genial biographical introduction, by Mr. Henry Kingsley, is likewise an attractive feature of this edition.*"—MORNING STAR.

Goldsmith.—GOLDSMITH'S MISCELLANEOUS WORKS. With Biographical Essay by Professor MASSON. Globe 8vo. 3*s.* 6*d.*

This edition includes the whole of Goldsmith's Miscellaneous Works—the Vicar of Wakefield, Plays, Poems, &c. Of the memoir the SCOTSMAN *newspaper writes: "Such an admirable compendium of the facts of Goldsmith's life, and so careful and minute a delineation of the mixed traits of his peculiar character, as to be a very model of a literary biography."*

Pope.—THE POETICAL WORKS OF ALEXANDER POPE. Edited, with Memoir and Notes, by Professor WARD. Globe 8vo. 3*s.* 6*d.*

"*The book is handsome and handy. . . . The notes are many, and the matter of them is rich in interest.*"—ATHENÆUM.

Spenser. — THE POETICAL WORKS OF EDMUND SPENSER. Edited by R. MORRIS, King's College, London. Globe 8vo. 3*s.* 6*d.*

⁂ Other Standard Works are in the Press.

GOLDEN TREASURY SERIES.

Uniformly printed in 18mo., with Vignette Titles by SIR NOEL PATON, T. WOOLNER, W. HOLMAN HUNT, J. E. MILLAIS, ARTHUR HUGHES, &c. Engraved on Steel by JEENS. Bound in extra cloth, 4*s.* 6*d.*; morocco plain, 7*s.* 6*d* morocco extra, 10*s.* 6*d.* each volume.

"*Messrs. Macmillan have, in their Golden Treasury Series especially, provided editions of standard works, volumes of selected poetry, and original compositions, which entitle this series to be called classical. Nothing can be better than the literary execution, nothing more elegant than the material workmanship.*"—British Quarterly Review.

THE GOLDEN TREASURY OF THE BEST SONGS AND LYRICAL POEMS IN THE ENGLISH LANGUAGE. Selected and arranged, with Notes, by Francis Turner Palgrave.

"*This delightful little volume, the Golden Treasury, which contains many of the best original lyrical pieces and songs in our language, grouped with care and skill, so as to illustrate each other like the pictures in a well-arranged gallery.*"—Quarterly Review.

THE CHILDREN'S GARLAND FROM THE BEST POETS. Selected and arranged by Coventry Patmore.

"*It includes specimens of all the great masters in the art of poetry, selected with the matured judgment of a man concentrated on obtaining insight into the feelings and tastes of childhood, and desirous to awaken its finest impulses, to cultivate its keenest sensibilities.*"—Morning Post.

THE BOOK OF PRAISE. From the Best English Hymn Writers. Selected and arranged by Sir Roundell Palmer. *A New and Enlarged Edition.*

"*All previous compilations of this kind must undeniably for the present give place to the Book of Praise. . . . The selection has been made throughout with sound judgment and critical taste. The pains involved in this compilation must have been immense, embracing, as it does, every writer of note in this special province of English literature, and ranging over the most widely divergent tracts of religious thought.*"—Saturday Review.

THE FAIRY BOOK; the Best Popular Fairy Stories. Selected and rendered anew by the Author of "JOHN HALIFAX, GENTLEMAN."

"*A delightful selection, in a delightful external form; full of the physical splendour and vast opulence of proper fairy tales.*"—SPECTATOR.

THE BALLAD BOOK. A Selection of the Choicest British Ballads. Edited by WILLIAM ALLINGHAM.

"*His taste as a judge of old poetry will be found, by all acquainted with the various readings of old English ballads, true enough to justify his undertaking so critical a task.*"—SATURDAY REVIEW.

THE JEST BOOK. The Choicest Anecdotes and Sayings. Selected and arranged by MARK LEMON.

"*The fullest and best jest book that has yet appeared.*"—SATURDAY REVIEW.

BACON'S ESSAYS AND COLOURS OF GOOD AND EVIL. With Notes and Glossarial Index. By W. ALDIS WRIGHT, M.A.

"*The beautiful little edition of Bacon's Essays, now before us, does credit to the taste and scholarship of Mr. Aldis Wright. . . . It puts the reader in possession of all the essential literary facts and chronology necessary for reading the Essays in connexion with Bacon's life and times.*"—SPECTATOR.

"*By far the most complete as well as the most elegant edition we possess.*"—WESTMINSTER REVIEW.

THE PILGRIM'S PROGRESS from this World to that which is to come. By JOHN BUNYAN.

"*A beautiful and scholarly reprint.*"—SPECTATOR.

THE SUNDAY BOOK OF POETRY FOR THE YOUNG. Selected and arranged by C. F. ALEXANDER.

"*A well-selected volume of sacred poetry.*"—SPECTATOR.

A BOOK OF GOLDEN DEEDS of all Times and all Countries. Gathered and narrated anew. By the Author of "THE HEIR OF REDCLYFFE."

"*. . . To the young, for whom it is especially intended, as a most interesting collection of thrilling tales well told; and to their elders, as a useful handbook of reference, and a pleasant one to take up when their wish is to while away a weary half-hour. We have seen no prettier gift-book for a long time.*"—ATHENÆUM.

THE POETICAL WORKS OF ROBERT BURNS. Edited, with Biographical Memoir, Notes, and Glossary, by ALEXANDER SMITH. Two Vols.

"*Beyond all question this is the most beautiful edition of Burns yet out.*"—EDINBURGH DAILY REVIEW.

THE ADVENTURES OF ROBINSON CRUSOE. Edited from the Original Edition by J. W. CLARK, M.A., Fellow of Trinity College, Cambridge.

"*Mutilated and modified editions of this English classic are so much the rule, that a cheap and pretty copy of it, rigidly exact to the original, will be a prize to many book-buyers.*"—EXAMINER.

THE REPUBLIC OF PLATO. TRANSLATED into ENGLISH, with Notes, by J. Ll. DAVIES, M.A. and D. J. VAUGHAN, M.A.

"*A dainty and cheap little edition.*"—EXAMINER.

THE SONG BOOK. Words and Tunes from the best Poets and Musicians. Selected and arranged by JOHN HULLAH, Professor of Vocal Music in King's College, London.

"*A choice collection of the sterling songs of England, Scotland, and Ireland, with the music of each prefixed to the words. How much true wholesome pleasure such a book can diffuse, and will diffuse, we trust, through many thousand families.*"—EXAMINER.

LA LYRE FRANCAISE. Selected and arranged, with Notes, by GUSTAVE MASSON, French Master in Harrow School.

A selection of the best French songs and lyrical pieces.

TOM BROWN'S SCHOOL DAYS. By an OLD BOY.

"*A perfect gem of a book. The best and most healthy book about boys for boys that ever was written.*"—ILLUSTRATED TIMES.

LONDON:
R. CLAY, SONS, AND TAYLOR, PRINTERS,
BREAD STREET HILL.

KINGS COLLEGE LONDON

12